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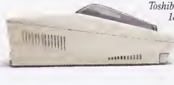

Toshiba ExpressWriter 311: 24 pin dot matrix, 180 cps draft/60 cps letter quality, 3 resident emulations (Toshiba Qume/ Epson LQ/IBM Proprinter), 16K buffer, 3 resident fonts, 16 font cards, 11 pounds, retractable handle.

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CIRCLE 101 ON READER SERVICE CARD

LOTUS

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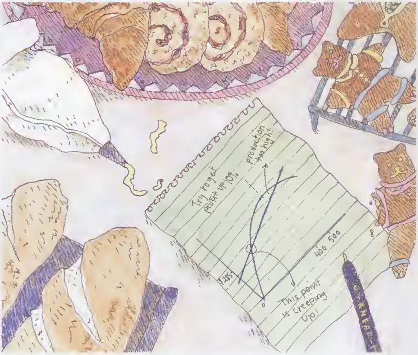

Try to get profit up 10%
production too high!
1215
0
400 500
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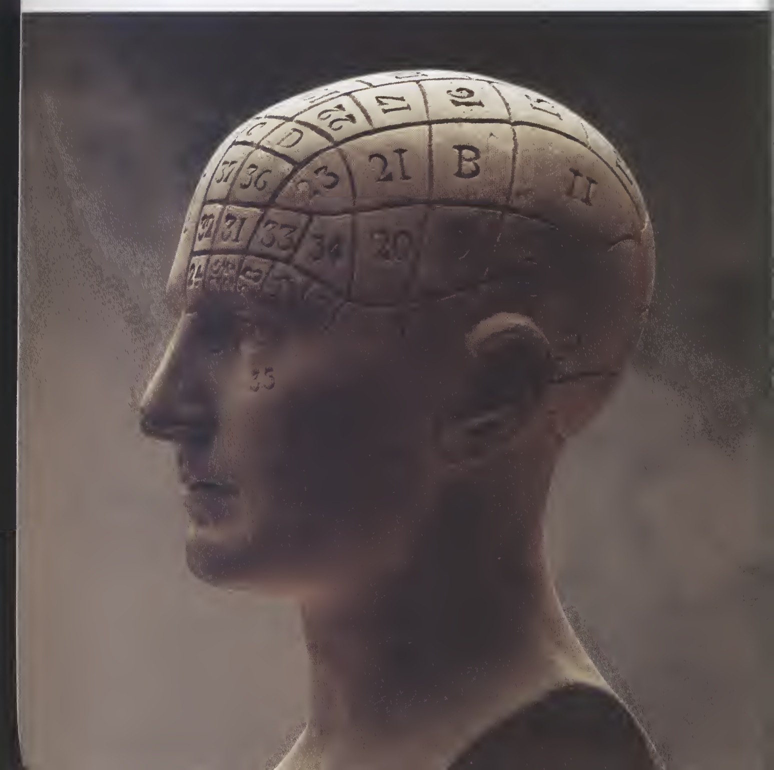
Our newest soft
like the software



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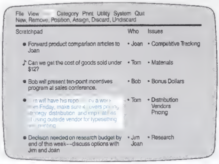

File View Category Print Utility System Quit
New, Remove, Position, Assign, Discard, Undiscard

Scratchpad	Who	Issues
● Forward product comparison articles to Joan	• Joan	• Competitive Tracking
♪ Can we get the cost of goods sold under $12?	• Tom	• Materials
● Bob will present ten-point incentives program at sales conference.	• Bob	• Bonus Dollars
● Tom will have his report by a week from Friday, make sure it covers pricing strategy distribution and implications of using outside vendor for typesetting and printing	• Tom	• Distribution Vendors Pricing
● Decision needed on research budget by end of this week--discuss options with Jim and Joan	• Jim Joan	• Research

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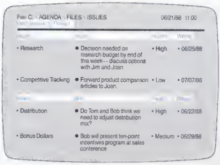

File: C:\AGENDA\FILES\ISSUES 06/21/88 11:00

			When
• Research	● Decision needed on research budget by end of this week-- discuss options with Jim and Joan	• High	• 06/25/88
• Competitive Tracking	● Forward product comparison articles to Joan.	• Low	• 07/07/88
• Distribution	● Do Tom and Bob think we need to adjust distribution mix?	• High	• 06/22/88
• Bonus Dollars	● Bob will present ten-point incentives program at sales conference	• Medium	• 06/29/88

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STAFF LETTER

WE KEEP LEARNING THINGS ABOUT YOU

Several months ago, we asked you to answer some questions and tip us off to some Lotus "heroes" and some offbeat spreadsheet applications. Many of you responded, and you can see the results in a special "Focus on You" section, starting on page 69 in this issue.

That's not all that's different about this issue. Because we get new subscribers every month, we decided to chance redundancy and devote this issue's Q&A section to some of the queries we have received most often over the years. In the same vein, the Good Ideas department contains some of the best ideas you've sent us.

And here's more input from you. More than 500 of you sent us your scores on our June quiz, "What's Your Lotus Quotient?" We don't know if the cards represent a fair sample of the results, but we're going to share our analysis with you anyway.

A maximum of 180 points was possible. The highest reported score was 175; the lowest, 20. The average was 125, or 69%.

As you can see from the table, your weakest area of expertise as a group is in *1-2-3* database techniques. This result dovetails neatly with the results of our August ballot (see page 74), which show that you consider Data Query to be by far the most difficult *1-2-3* command. You'll feel better after you read this month's cover story.

The next weakest area is the @functions. We already knew that many of you do not make the best use of these powerful tools. That's why we're planning a special section on @functions for one of next year's issues.

HOW YOU DID ON THE QUIZ

	Average Scores	
	Points	Percent
Overall score	125	69
General *(60 pts)*	47	78
1-2-3 database *(35 pts)*	19	54
Graphics *(35 pts)*	24	69
Macros *(25 pts)*	18	72
@functions *(25 pts)*	15	60

We asked you to comment on the quiz, and about half of those who did said it was too easy. The other half said it was too hard. Some of you complained that certain questions were poorly worded. And we have already acknowledged (October, page 4) that questions 16 and 20, both on graphics, have more right answers than we indicated.

A few of you felt that we had concocted some tricky questions to hold down scores. That we did not do. An example cited was question 23, in which you had to catch a misspelling—WINDOWOFF instead of WINDOWSOFF—in a macro. We included the question because we know that such errors are quite common among macro writers.

Most of you who replied said you enjoyed the quiz. We liked hearing from you too. So we may do it again sometime.

The Editors

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CIRCLE 102 ON READER SERVICE CARD

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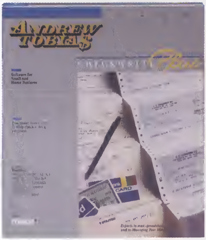

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LETTERS

BETTER ODDS ON SIX ROLLS

In Daniel Seligman's game of six balls in seven numbered slots [August Essay], there are 117,649 outcomes possible. This number is 7 raised to the 6th power, as there are seven possible outcomes for each of the six rolls. I have calculated the possible outcomes and, of these, the number of ways to get a winning score (under 12 or over 30) is 1,461. So the true odds are about 80.5 to 1, rather than the 109 to 1 observed by Mr. Seligman. Indeed, since he ran 1,000,000 simulations of the game, Mr. Seligman should carefully review his simulation methodology.

Mark Thompson
End-User Information Systems
S&A Restaurant Corp
Dallas, Tex

The author replies: *Checking Mark Thompson's numbers, I found to my dismay that they are correct. My adjusted BASIC program now reliably simulates odds close to 80 to 1.*

WHO IS THIS OUTLINER FELLOW?

Wonderful. What great fun! My upgrades arrive for *Symphony*. On one machine I am going from Release 1 to Release 2.0 and on another from Release 1.2 to Release 2.0.

Among the grand new features: the Outliner and the Speller.

Waxing eloquent in a letter, I describe the virtues of the Outliner. Then, before sending the letter I do the proper thing: I run the Speller. Marvelous how that Speller finds words that it does not recognize as properly spelled.

What does Speller say is not properly spelled? *Outliner*, of course.

R. Hopkins Holmberg
Nairobi, Kenya

GET YOUR DOLLAR SIGNS IN LINE

Thanks to Peter G. Aitken for "A Beginner's Guide to Global Settings" [July], which I have added to the required reading list for the course in which I teach *1-2-3* applications to accounting majors. I heartily agree that it's best to set global settings for format and column width before assigning range formats and individual column widths. However, I disagree with his suggestion of using a currency format for accounting models. I direct my students to use the comma format, then to place dollar signs in the appropriate rows of a column with a width of 1 so that the dollar signs are aligned.

Jean Marie B. Hudson
Associate Professor of Accounting
Lamar University
Beaumont, Tex.

The author replies: *Your approach results in a neater worksheet and is useful for small models in which the use of additional columns to hold the dollar signs doesn't significantly interfere with pointer movement. However, using this technique in a large model, you may find moving the pointer quite laborious.*

MACRO NO-NO AND YES

In "Bug Swatters for Macros" [May], Paul Kintner broke a cardinal rule of macro writing: He used the macro keyword {RETURN} as a range name. As a product-support specialist, I can confirm that this invalid use of range names is responsible for many macro problems.

Donald Plotnick
Lotus Development Corp
Cambridge, Mass.

Editor's note: *We also confirm that you shouldn't use keywords as range names; unfortunately, we let this one slip past. The {RETURN} command normally ends processing of a subroutine. However, once you've assigned the name* return *to a cell,* 1-2-3 *and* Symphony *interpret any occurrence of the {RETURN} command to mean, "Call the subroutine named* return.*"*

Except in some very unusual circumstances, do not assign command keywords as range names. If you have used these bug swatters with any macros that call subroutines, replace the range name return *with the name* ret. *Then replace the {RETURN} statement within the bug-swatting macro with the statement {RET}. Several bugs may suddenly vanish. Thanks also to Michael Szumski, of New York, for pointing out this problem.*

I enjoyed the article on debugging macros. However, the author did not mention the method I use most when debugging macros: the STEP key.

When you press the STEP key, the word *STEP* appears at the bottom of the screen. While the macro is running, the letters SST appear in a flashing red box at the bottom of the screen. Pressing the STEP key before running a macro makes it necessary for you to press Return for each macro command to be processed. You can watch each step of the macro as it runs and easily determine where the bugs are. To turn off the STEP key, just press it again.

Kathleen Goeldner
El Paso, Tex

WHAT WE LOST WHEN WE WON BY LOSING

Editor's note: *After we published "How to Win by Losing" (August), the mail poured in, proving that investing in real estate is a hot topic. We asked the author, Tim K. Nguyen, to modify his model, using some readers' suggestions. To leave room for the new model, we won't print the letters. But we would like to thank those who wrote, in particular, Reid H. Davis, Larry Heyman, Tim A. Mathias, Ken Neil, Martin A. Parmer, John R. Stegmuller, and Shana K. Wolfe, for their contributions to the revised model. What follows is Mr. Nguyen's addition to the article.*

As was true with the original model, what follows is meant to be used as a starting point in evaluating whether a particular property would be a good investment. Even as revised, the model takes a simplistic view of the tax world and does not consider the impact of fluctuating interest payments, amortization of the mortgage, balloon payment, abolishment of the depreciation recapture rule, and other tax law idiosyncrasies. Nor does the model provide for sensitivity analysis. Also note that in this model all taxes, points, closing costs, and so on are considered part of the original purchase price.

This model is not, and never was intended to be, a substitute for the careful analysis of experienced tax and real estate professionals.

Steps for revising the model are listed under the heading "To revise the model." Newly inserted material is shown in red in the figure.

Rows 15 and 16 account for the fact that land cannot be depreciated. How much of the purchase price is allocated to land varies widely. In this example, $20,000 of the $50,000 is allocated to land and therefore subtracted from the purchase price, leaving $30,000 as the depreciable amount.

Rows 50 and 51 account for the fact that the depreciation taken over the years actually reduces the tax basis of the property. The net effect is that the net profit realized at resale (cell C57) is larger than before.

Rows 59 and 60 account for the tax liability incurred at the resale of the property. The profit on the resale is reduced by the taxes paid.

The benefit from owning the property, in cell C66, now includes the negative cash flow for each year you hold the property.

Cell C70 still shows a positive return on investment, which means that in spite of the losses, the investment produces a profit. With this information, you'd probably want to make a more precise forecast of the profit possibilities. For this, forecast the cash flows stemming from holding and disposing of the investment, and to these cash flows apply a financial measure such as the @NPV or @IRR function. If you find profitable investments and want to perform such a forecast, consider reviewing two articles in *LOTUS* on using the @IRR function [February 1987] and the @NPV function [March 1986] and the reader letters that discussed the two features. Incidentally, both features used real estate examples.

To revise the model

Set the width of column A to 26. Insert three rows at each of the following rows: 15, 50, and 59. Insert one row at row 67. Format cell B59 to display percent with no decimal places. (Commands for formatting are in the original article.) Enter the labels shown in red. Enter *−20000* in cell C15 and *.28* in cell B59. Erase the contents of cell C65. Enter the following formulas and press the CALC key.

Cell	Formula
C16	+C14+C15
C19	@SLN(C16,0,27.5)
C50	+C19*C48
C51	+C46−C50
C55	+C53−C51
C59	+C57*B59
C60	+C57−C59
C66	(C60+C62)+(C8*C48)
C70	(C66−C68)/C68

	A	B	C	D
1	PROFIT/LOSS WORKSHEET			
2				
3	Monthly Rent		$700.00	
4	Total Monthly Expenses		$855.00	
5				
6	Monthly Profit (Loss) Before Depr.		($155.00)	
7				
8	Yearly Profit (Loss) Before Depr.		($1,860.00)	
9				
10				
11				
12	Depreciation Calculation			
13				
14	Initial Purchase Price		$50,000.00	
15	Less Amount Allocated to Land		($20,000.00)	
16	Depreciable Amount		$30,000.00	
17				
18	Yearly Depreciation Allowance			
19	(Straight-line Over 27.5 Years)		$1,090.91	
20				
21	Yearly Profit (Loss) with Depr.		($2,950.91)	
22				
23				
24	Tax Saving Computation			
25				
26	Yearly Income		$30,000.00	
27	Tax Bracket Break Point		$29,750.00	
28	Income Over Break Point		$250.00	
29				
30	Profit (Loss) For Tax Purposes		($2,950.91)	
31				
32	Tax Saving on			
33	Income Below Break Point at 15%		($405.14)	
34				
35	Tax Saving on			
36	Income Over Break Point at 28%		($70.00)	
37				
38				
39	Yearly Tax Saving		($475.14)	
40				
41				
42				
43				
44	Property Appreciation and Net Benefits			
45				
46	Initial Purchase Price		$50,000.00	
47	Appreciation Factor		10%	
48	Holding Period		5	
49				
50	Total Depreciation over Holding Period		$5,454.55	
51	Tax Basis of Property		$44,545.45	
52				
53	Value at End of Holding Period		$80,525.50	
54				
55	Gross Profit at Resale		$35,980.05	
56	Less Resale Expenses	10%	($8,052.55)	
57	Net Profit Realized at Resale		$27,927.50	
58				
59	Tax on Net Profit	28%	$7,819.70	
60	After-Tax Profit on Resale		$20,107.80	
61				
62	Tax Saving During Holding Period		$2,375.68	
63				
64	Benefit From Owning Property			
65	(profit plus tax savings less			
66	negative cash flow)		$13,183.48	
67				
68	Initial Investment		$10,000.00	
69				
70	Return on Investment		32%	

Newly inserted and revised material is shown in red.

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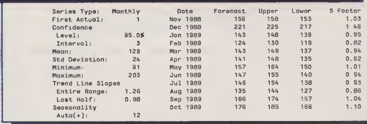

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Series Type:   Manthly          Dote      Forecast    Upper    Lower       S Foctor
First Actual:        1        Nov 1988         156      158      153           1.03
Confidence                    Dec 1988         221      225      217           1 46
 Level:          95.0%        Jon 1989         143      148      139           0.95
 Intervol:           3        Feb 1989         124      130      119           0.82
Mean:              129        Mar 1989         143      149      137           0.94
Std Deviotion:      24        Apr 1989         141      148      135           0.92
Minimum:            91        May 1989         157      164      150           1.01
Maximum:           203        Jun 1989         147      155      140           0 94
Trend Line Slopes             Jul 1989         146      154      138           0 93
 Entire Ronge:    1.26        Aug 1989         135      144      127           0.86
 Lost Holf:       0.98        Sep 1989         166      174      157           1.04
Seosonality                   Oct 1989         176      185      166           1.10
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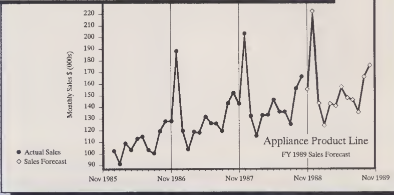

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SPREADSHEETS: LOOKING TO THE FUTURE

They will be the link between remote databases.

The year is 2001. In a secluded office, an executive works late, preparing for an important sales meeting. In her own English-language "shorthand," which her spreadsheet program has learned and understands, she requests large amounts of data from databases located in sales offices worldwide. She receives the data almost instantly and quickly consolidates and converts it into a slick-looking set of graphs. Everything is ready for tomorrow's meeting. Confident, she turns off the computer and goes home for a good night's sleep. Nothing unusual. All in a day's work.

This vision of future computing power is founded on today's 80386-class chips and the more powerful CPUs that will follow. The internal-processing power of the PC already equals that of a minicomputer, says Richard Shaffer, editor of the New York–based *Technologic Computer Letter*. He believes that in the future we will fully harness this power.

Digesting gigabytes

Richard Sherlund, a securities analyst with Goldman, Sachs & Co. in New York, says the CPU chips, graphical user interfaces, networks, and operating systems of the future are the four legs of the new technological platform that will support future spreadsheet software. As better and faster input/output devices reach the market, the PC will be able to communicate, store, sort, and display gigabytes of information almost instantaneously.

Most analysts agree that spreadsheets will remain a vital part of tomorrow's computer systems. Ever since its introduction, the electronic spreadsheet has given us a powerful and easily understood way of looking at data. *VisiCalc* was the first electronic spread-

DIANE TESKE HARRIS

sheet for the personal computer. As powerful as spreadsheets have become, we will see yet a new round of significant improvements during the next few years. According to Bob Frankston, who wrote the original *VisiCalc* program with Dan Bricklin and who is now chief scientist for Lotus Development Corp., the spreadsheet will be a core element of most computer systems. Says Frankston: "Even people who don't think of themselves as spreadsheet users will have a spreadsheet as a built-in component of the computer environment in which they work."

The developers we spoke with were reluctant to discuss the specifics of products currently on the drawing board, but all agreed that the features of future spreadsheets will dwarf those of today's programs. The development of spreadsheets will be evolutionary, and as *Technologic Computer Letter* Editor Shaffer put it, "They will eventually become windows into information databases."

In the near future, developers will enhance current products by incorporating such features as a graphical user interface, presentation-quality output, integrated database-management systems, and word processing within one program. Brian J. McGrath, a Plano, Tex., consultant with expertise in strategic planning for decision-support systems, foresees the incorporation of expert-system technology into spreadsheet design. This technology will walk an executive through the process of obtaining and analyzing data. Future spreadsheets will "learn" the types of queries a user performs, making the query process much faster. They will also learn what types of models a user builds and will place data into the correct cells automatically.

An easier way to work

Steven Frankel, a vice president with Adams, Harkness & Hill, a Boston, Mass., institutional brokerage firm, agrees: "I want to be able to pour data into one end of my model and have it come out the other end without having to learn arcane technical commands, code names, SQL [Structured Query Language] queries, and so forth. Even when my function is to chart data on the mainframe, I'll want to do that via the spreadsheet because it's a very comfortable arena to work in."

People who use the spreadsheet of the future will demand publishing and general-report-writing capabilities, according to Jeffrey Tarter, publisher of *Softletter*, a software-industry newsletter based in Cambridge, Mass. Spreadsheet-publishing capability, he says, is the ability to control the typography and layout of the output. The spreadsheet will be an engine for processing forms as well as numbers.

FUTURE SPREADSHEETS WILL BECOME ENGINES FOR PROCESSING FORMS AS WELL AS NUMBERS.

"Right on the screen," Tarter continues, "you'd want to show the visual and typographic clues a good form offers, such as shading, various typefaces, and boxes." In addition, a good forms processor should offer a set of tools for easily modifying the layout of a form and for making other editing changes.

Sam Redman, a director of The Lucid Group, in Dallas, which is best known for its *Lucid 3-D* spreadsheet, says that future spreadsheets will be able to view data on many levels. He gives this example: "If a stock price catches my attention, I can graph the price movement since the company was founded, then zoom in on one week and review national and international news that may have affected the stock price. I can ask how many other people reviewed this stock on a particular day, print out a copy of the company's most recent annual report, and examine how its competitors are doing. I'll even be able to discover if I know someone who knows any of the managers who work within that company."

All this is achievable now, most experts say, but future spreadsheet software will greatly reduce the amount of time and the level of skill necessary to gather and manipulate relevant data.

"Whatever Merrill Lynch analysts are currently able to do using mainframes will be done handily by future spreadsheet software," says Redman. "Everyone will be doing it."

—Robert Moskowitz

A TYPICAL DESKTOP SYSTEM IN THE YEAR 2001

At the turn of the century, your spreadsheet software will run on a PC that is significantly more powerful than the one currently on your desk.

Because of the requirements of program size and expanded operating systems, your PC, says Lotus's chief scientist, Bob Frankston, will need at least 100 megabytes of RAM. Data and programs will require at least a few gigabytes of storage. New computer technologies, such as parallel processing, will speed data flow and calculations.

Computer consultant James Martin says that by the end of the decade, low-priced personal computers will reach speeds of 1 million instructions per second (mips). Medium-priced PCs will run at 3 mips, while personal workstations will hum along at 10 mips.

In the 21st century, virtually no PC will be a stand-alone system. Networks will be far more prevalent than they are today. A PC user will be able to find and download data from virtually any computer on the network, anywhere in the world. However, computer networks will be increasingly threatened by powerful, data-destroying virus programs. And more-elaborate security measures and social conventions will limit your desktop-computer's ability to, say, examine the military budget of the Soviet Union.

The price of such computing power won't be much higher than the cost of today's well-equipped microcomputer—about $10,000. According to Richard Shaffer, the editor of *Technologic Computer Letter*, computers are decreasing in price by between 20% and 35% per year. Although this is an aggressive scenario, Shaffer says that today's $2 million mainframe may cost $10,000 in 12 years. Another way to visualize the pricing pattern is to think back to 1976, when an IBM System/360 or System/370 provided about the same computing power as today's microcomputers, but at a cost of $1 million or more.

—R. M.

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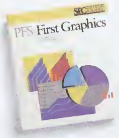

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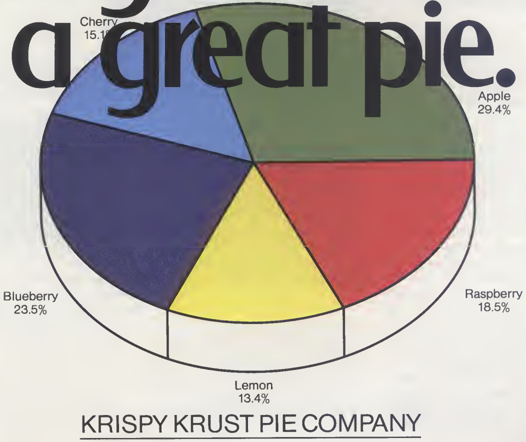

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COMPUTER GAMES KEEP GETTING BETTER

And the PC is in on the fun.

In the recreational-software market, IBM PCs and compatible computers have long been second-string players, behind Apple, Amiga, and Commodore machines. Now, however, they are moving up to the first string because software developers can no longer ignore the overwhelming size of the installed base. Virtually all new games and recreational-software products, including our picks for this year, run on IBM and compatible PCs (see the next article).

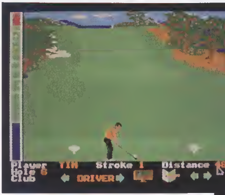
"Our business has turned from 70% Apple to 70% IBM," says Steven Greene, vice president of sales and marketing for Polarware (Batavia, Ill.), a manufacturer of games and educational software.

According to figures from the Software Publishers Association (Washington, D.C.), the shift of focus has been successful. The overall domestic games market is up strongly: Sales of MS-DOS recreational software for 1988 are up more than 31% over 1987, with expected retail sales of $335 million for 1988.

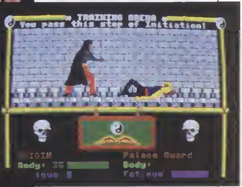
More power, better graphics

Game buyers are faring well in the process, since PCs are more powerful than earlier game favorites like the Apple II and the Commodore 64, and developers are using the PC's high-resolution graphics and increased processing power to good effect. "3-D graphics is pure mathematics, and the IBM can churn through that well," says Sid Meier, vice president of software development for MicroProse Software (Hunt Valley, Md.), a leading developer of simulation software.

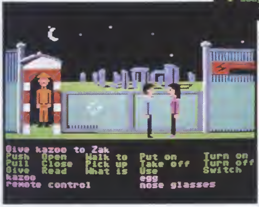
The widespread use of the IBM Enhanced Graphics Adapter and Video Graphics Array standards has also made the MS-DOS games market more attractive. Some manufacturers, like Lucasfilm Games (San Rafael, Calif.), have already foregone lower-level graphics technology in favor of the VGA standard. "Everything below VGA will have fewer features," says Doug Glen, Lucasfilm director of marketing. *Battlehawks 1942*, the company's new combat-simulation game, uses a 256-color palette in the VGA mode but offers only 16 colors on an EGA system.



Accolade's *Mean 18* golf simulation pits you against the computer or another player.



You'll need a little judo and a lot of time for *Moebius*, Origin Systems' complex fantasy game.



***Zak McKracken and the Alien Mindbenders*, from Lucasfilm Games, is a 3-D comedy/thriller.**

Allan Epstein, president of Accolade (San Jose, Calif.), an entertainment-only software company, agrees that the graphics potential of the PC is leading to some exciting new products. He admits, however, that the PC is not without drawbacks as a games machine. "It is pathetic from the standpoint of sound," he says.

Glen and others think the next big breakthrough will be games that use CD-ROM technology, which will increase the graphics potential of games even more. Says Glen, "CD-ROM will eventually provide stunning animated images over a digitized backdrop."

"People are used to television and movies," says Steve Meyer, vice president of product development at MicroProse, "and we are moving closer to products that attain that [graphics] level."

—*Jon Pepper*

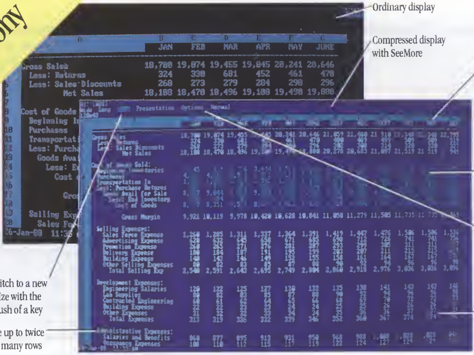
THE YEAR'S BEST GAMES

Just in time for the holidays

The following products are our favorites among this year's releases, and we probably tested a few of them longer than absolutely necessary. Some of the games are easy to learn and master; others are more difficult and can take hundreds of hours to play out. But before you forsake your favorite spreadsheet for some alien battlefield, consider investing in a good joystick. It will give you much smoother control over the game functions.

Cars: One of the hottest titles around is *Test Drive*, ($39.95, from Accolade, San Jose, Calif.), which has shipped more than 100,000 units. *Test Drive* gives you a simulated opportunity to put the pedal to the metal in any of five

For 1-2-3 and Symphony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Unretouched photo of EGA display.

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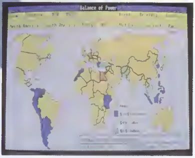
Sports: Accolade also has a lineup of simulations for the die-hard sports enthusiast. *4th & Inches* ($39.95) is an absorbing football simulation that you can play against either the computer or another player. *Mean 18* ($44.95), a golf simulation for one to four players, might attract even nongolfers. The action is realistic, and in case you manage to master the three courses on the *Mean 18* disk, supplemental disks with famous courses are available. You can even design your own course with the included Golf Course Architect Set.

In *Jordan vs. Bird: One on One*, from Electronic Arts, you can play either of the NBA's best.

Hoop fans will love *Jordan vs. Bird: One on One* ($39.95), Electronic Arts' (San Mateo, Calif.) successor to its classic *Dr. J and Larry Bird Go One on One* ($14.95). You can take on either of the NBA's two best, playing the computer



Test your commander-in-chief potential with *Balance of Power*, from Mindscape.

INTERVIEW: ARE PC INNOVATORS A DYING BREED?

Industry veteran John McMullen says that MIS is back in power.

In the computer industry, the term *old-timer* often means someone who has two or three years of experience. So it's refreshing to find someone like John McMullen, who has been involved with computers long enough to see the profound changes that have taken place over the decades.

McMullen and his wife, Barbara, are principals of McMullen and McMullen, a computer consulting and training firm. Corporate headquarters is a 200-year-old barn in upper Westchester County in New York. McMullen has been in the data-processing field since 1961, when he worked for a Defense Department installation. Before forming his company in 1978, he oversaw a number of computer-system installations in the Wall Street area and was a vice president of a Control Data Corp. subsidiary that served the financial industry. Earlier he was the director of data processing for the investment banking firm Morgan Stanley & Co. In addition to consulting, McMullen teaches computer courses at The New School for Social Research in New York City.

LOTUS asked McMullen about the past, present, and future of computers, especially their ever-changing role in corporate America. The interview was conducted in September by Stan Miastkowski.

LOTUS: How did you make the break from mainframes to microcomputers?

J. M.: When Barbara and I formed McMullen and McMullen, we intended to concentrate on our area of expertise: mainframe financial systems. I saw my first Apple computer at Morgan Stanley, and we thought we'd like to have one for keeping our accounting records and for word processing. When *VisiCalc* was introduced, we quickly saw its potential for financial firms. We started installing *VisiCalc* for clients, such as Morgan Guaranty Trust Co. and First Boston Corp., and we were responsible for introducing microcomputers to these firms. Eventually, the majority of our work centered around PCs. Later, we were a beta test site for *1-2-3*, and as soon as it was released, we began to install that program for clients.

LOTUS: What sort of person became involved with personal computers a decade ago?

J. M.: In the late 1970s, people who bought the Apple II and *VisiCalc* tended to be the innovators in large corporations. They were folks like financial analysts and planners—people who were outside the mainstream of data processing.

LOTUS: How have these people changed over the years?

J. M.: Large corporations have come full circle. The MIS [management information services] department is again controlling the computers. It has regained power because of the complexity of corporate computer operations. With an increasing number of PCs connected to networks and mainframes, MIS people want to standardize on a few software packages and hardware systems that they can support. This is good in that it restores order out of chaos, but most MIS people are not innovators. For instance, although 90% of corporate users are contented with *1-2-3*, *Microsoft Word*, and a database running under DOS, 10% would be better served by a Macintosh computer and other software. However, most large corporations offer little or no choice because the MIS department can't support a lot of different systems.

LOTUS: What will happen to those innovators?

J. M.: The original innovators were people who wanted to do their jobs better. Many of them drifted off to become computer specialists. The computer guru in an accounting firm often became a computer person rather than an ac-

or a friend. The game also has an Air Jordan slam-dunk contest and a three-point shoot-out featuring Larry Bird. It has great VGA graphics and no copy protection.

Outer space: If you prefer a little interplanetary action, look into *Skyfox II: The Cygnus Conflict* ($39.95), also from Electronic Arts. You get to pilot the Skyfox fighter through the galaxy, defending the Federation against enemy craft. It features very fast action and is not copy-protected.

Electronic Arts' *Sentinel Worlds I: Future Magic* ($49.95) combines elements of science fiction, mystery, adventure, and strategy. You and your handpicked crew of five can explore space and solve the vexing problems of future worlds.

People and places: The earthbound star struck will enjoy *Ticket to Hollywood* ($39.95), from Blue Lion Software Corp. (Cambridge, Mass.). Scout around Tinsel Town, answer some trivia questions, and learn about your favorite screen stars. Or try *Where in Europe is Carmen Sandiego?* ($39.95), the sequel to two other Carmen Sandiego adventures, from Broderbund Software (San Rafael, Calif.). The game includes the *Rand McNally Concise Atlas of Europe* and provides an entertaining geography lesson.

Politics: Those with political ambitions should try *Balance of Power* ($49.95), from Mindscape (Northbrook, Ill.), a remarkably sophisticated simulation of international politics. As either the president of the United States or the general secretary of the U.S.S.R., your goal is to accumulate political prestige while avoiding global nuclear war. You definitely want to read the manual before you try this one, even if you choose the beginner level. The game comes with a run-time version of *Microsoft Windows.*

Action and adventure: Fantasy role-playing games are getting more and more complex, and two of the most elaborate are *Moebius* ($39.95) and *Ultima V* ($59.95), both from Origin Systems (Londonderry, N.H.). *Moebius* puts you into an ever-changing 3-D landscape as a disciple of Moebius the Windwalker. You'll need martial-arts talent and a lot of free time, since playing time averages 50 to 100 hours. If you still have idle hours, try *Ultima V,* whose players have been known to spend 200 hours or more trying to complete the game, which occupies

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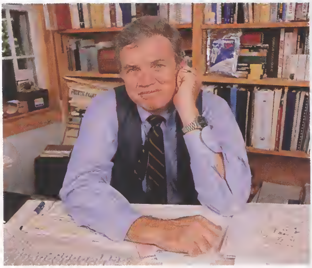
countant. However, most people use the computer as a tool, and as tools get more refined, everyone will be able to use them to do their jobs better. There will always be innovators, but perhaps fewer will gravitate to PCs than did seven or eight years ago.

LOTUS: What about the move to OS/2 and Unix?

J. M.: There's so much confusion about OS/2, OS/2 Extended Edition, Presentation Manager, *Microsoft Windows*, and the ramifications of the Apple Computer lawsuits. The truth is, just as *VisiCalc* sold the Apple II and *1-2-3* sold the IBM PC, there has to be some application that warrants a move to OS/2. Whatever happens, we're back to an era of technical complexity. Data-processing groups have to get involved and set the standards. Individual users won't be wiring Ethernet.

LOTUS: In your New School courses, do you run across people with unrealistic expectations about computers?

J. M.: Lots of people take computer courses because they've been told that computers are the future. Unfortunately, many of them are unprepared even for clerical work. They've been sold a bill of goods by television ads and employment agencies.



JOYCE RAVID

LOTUS: Is software getting easier to use?

J. M.: Yes and no. We want software to be easy to use, but we also want it to be functionally complete. Even in the most intuitive software environments, the software remains complex.

LOTUS: Is there hope for improvement?

J. M.: Moving in the direction of programs that run under Presentation Manager will help. Even among the best MS-DOS programs, there's no consistency among identical functions. For example, *1-2-3* has File and Retrieve commands; in *Microsoft Word*, it's Transfer and Load. That kind of learning won't be necessary in the next generation of PC software. However, people also demand more functions.

LOTUS: Will we have programs with 5,000 features?

J. M.: The market's heading that way, but nobody knows what functions people will use. Someday, a market study may find that six people in the country actually use trigonometric functions. However, all programs will have to have them because either Lotus or Microsoft programs do.

Everyone thought the attraction to *1-2-3* was due to multifunctionality. You could graph data and set up a database. *Framework*'s philosophy was that if three things were good, five must be even better. But *Framework* didn't sell as expected. *1-2-3* became popular because it was far superior to the competition at the time.

LOTUS: Will the magic go out of computers?

J. M.: It already has. When you walk through a major trade show like PC Expo, you hear people asking the dull questions we asked 15 years ago when we talked about mainframe throughput and power. At MacExpo, the Macintosh trade show, some electricity still exists. However, even that will disappear when the software differs in function rather than type of interface. ■

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CIRCLE 105 ON READER SERVICE CARD

Explore outer space with a crew of five in Electronic Arts' *Sentinel Worlds I: Future Magic.*

four 5¼-inch disks. As you attempt to depose the merciless Blackthorn, you must interact with other characters, enact battles, and learn the complex landscape of Ultima V. The game offers highly detailed, 16-color EGA graphics.

On the lighter side, Mindscape offers *Paperboy* ($39.95), which was originally a big arcade hit. The game challenges you to make it through seven days of a paper route, while you try to avoid pitfalls not often encountered in suburban neighborhoods. It may be easy to play, but it's not easy to win.

Pirates ($39.95), from MicroProse Software (Hunt Valley, Md.), is one of the few simulations with a historical perspective. It is circa 1600, and as captain of a pirate ship, you sail the seas searching for treasure. *Pirates* is an easy-to-learn combination of 3-D graphics, combat, and strategy. We highly recommend it.

Other action games worth investigating include *Operation: Clean Streets* ($34.95) and *Space Racer* ($29.95), two 3-D animation titles from Broderbund. Also look into *Ikari Warriors* and *Victory Road*, both $39.95, from Data East (San Jose, Calif.).

Two of the freshest games of the season are *Maniac Mansion* and *Zak McKracken and the Alien Mindbenders*, both $44.95, from Lucasfilm Games (San Rafael, Calif.). These innovative 3-D comedy/thrillers are unique in their approach and sense of humor. Unlike other interactive games, you don't need to type your queries—you can construct sentences with a mouse by clicking on the words and phrases displayed at the bottom of the screen. If you need extra help, a few enthusiasts have written "hit" books—that is, the computer-game equivalent of literature's Cliff's notes. Urbane, campy, and just plain fun, these games get a strong endorsement.

Exercise: Finally, if all this sitting around playing games cuts into your exercise schedule, you can minimize the damage with the CompuTrainer and *RacerMate Challenge* combination. From RacerMate (Seattle), the package costs $749 to $799, depending on your bike. The CompuTrainer hardware converts a regular bicycle into a stationary bike. When you connect the CompuTrainer to your PC's serial port and run the *RacerMate Challenge* software on your PC, your PC screen becomes a race course of varying terrain. The display also plots speed, distance, time elapsed, and calories expended.

Happy Holidays! *—Jon Pepper*

SPRUCING UP 1-2-3

New add-ins jazz up spreadsheet printouts.

In this era of slick TV commercials and snazzy tabloids, the plainness of *1-2-3* printouts is disheartening to many users. Microsoft upped the presentation-quality ante for spreadsheets when it released *Microsoft Excel* last year. "*Excel* has set a [graphics] standard that can't go unanswered," says Jack McGrath, editor and publisher of *@MAX*, an independent *1-2-3* newsletter based in Hingham, Mass.

Ultimately, the Lotus Development Corp. answer will be the print-enhancement capabilities in *1-2-3* Release 3, which is scheduled to ship in the second quarter of 1989. In the meantime, Lotus is taking steps to prevent *Excel* from eroding *1-2-3*'s market share. Toward that end, the company is giving away a copy of *Allways*, Funk Software's spreadsheet-enhancement program, with every purchase of *1-2-3* Release 2.01. The limited-time promotion will continue while supplies of *Allways* last.

The first add-ins

Allways is the first of possibly many add-in programs designed to jazz up *1-2-3*. Funk's $149.95 program turns a character-based *1-2-3* spreadsheet into a graphic, WYSIWYG (what-you-see-is-what-you-get) display. You can use eight fonts on a page (in sizes from 5 to 24 points), draw boxes around worksheet titles or ranges, dress up a work-

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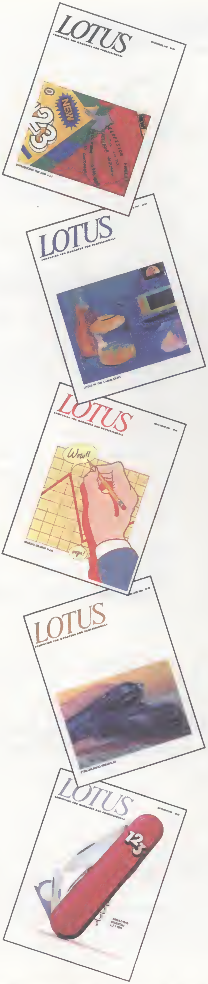

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sheet with underlining and shading, and incorporate graphs (*1-2-3* PIC files) on the same page as the spreadsheet. For a broader description of the program, see New Products, page 108.

Jewell Technologies (Seattle) expects to ship a similar program by year end. Its program, *Spreadsheet Publisher*, was originally to be marketed by Turner Hall Publishing (Cupertino, Calif.), publisher of several *1-2-3* add-ins. However, Turner Hall's director, Paul Thatcher, believed that Lotus would build print-enhancement capabilities into *1-2-3* Release 3 and that "the market for an add-in product like *Allways* would evaporate in six months or so."

> GOOD LOOKS ALSO ENHANCE MEANING.

Release 3 won't do it all

In fact, *1-2-3* Release 3's enhanced print capabilities will be restricted almost entirely to the GRAPH environment. "Release 3's font handling is oriented toward graphics, not to the spreadsheets themselves," says Chris Randles, director of marketing for Lotus's PC Spreadsheet Division. In addition to increased font capabilities, Release 3 will have more graph types and more color and shading options. It will also let you print graphs and spreadsheets on the same page, and it will print in the background.

However, since Release 3 will focus its print enhancements on the graphics side, there will still be room for programs like *Allways* and *Spreadsheet Publisher*, which enhance the spreadsheet. And as Randles points out, Lotus will continue to market and probably upgrade Release 2.01, sustaining the present rationale for add-ins that improve the output of the current version.

Purists might see all this spreadsheet sprucing as simply a matter of cosmetics. But as users have learned from other applications that have gone through the presentation-quality revolution, good looks enhance meaning. Says industry watcher Jeffrey Tarter: "If you must stare at pages and pages of numbers, you want them to be as readable as possible." —*Henry Fersko-Weiss*

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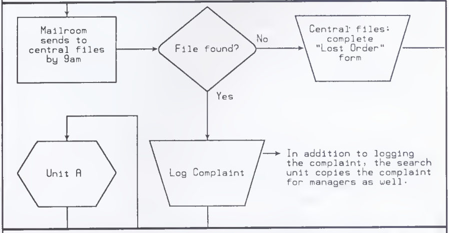
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CIRCLE 106 ON READER SERVICE CARD

LOTUS USERS SWAP HELP VIA WORLD NETWORK

Discussions over Lotus Echo range from trivial to arcane.

Greg Hanfbauer, a CPA in Cincinnati, bought his first modem in 1984. Soon afterward, he discovered a conversation about *1-2-3* on a local FidoNet bulletin board. At the time, he was having trouble with multiple-line text entry in a *1-2-3* spreadsheet, so he left a message outlining his problem. "Within 24 hours I had a helpful response," he says. "I've been repaying that assistance ever since."

Hanfbauer is now coordinator of Lotus Echo, a message-distribution service that runs on the FidoNet telecommunications network. So far, it is the most ingenious way Lotus users have evolved to exchange advice and support.

FidoNet consists of some 4,000 microcomputer users around the world. The network began in 1983 as the vision of a West Coast programmer named Tom Jennings, but it has since been extended by the international community of telecommunications hobbyists. Unlike most wide-area networks, FidoNet does not require expensive hardware and software. It runs on microcomputers, uses ordinary phone lines, and costs little or nothing.

Exchanging messages worldwide

Each FidoNet member, or node, can act either as a relay, accepting text or programs and passing them on to the next node, or as a terminal point at which messages can be sent and received. Data stored at any one node can be received by any other in the network within a day or two. Some FidoNet messages are addressed to specific individuals at specific nodes, just like letters or phone calls, but FidoNet can also handle messages addressed by subject.

For example, node A might collect messages on the subject of cars. After 24 hours or so, it might pass on the collection of car messages to node B, either automatically or in response to a request. Node B's users may add comments, which are then transmitted back to node A. Despite the complexity of executing these exchanges in a 4,000-member system, these subject-oriented message streams, called echoes, now dominate FidoNet traffic. There are echoes on alcoholism and animation, midwifery and Vietnam Vets, and every imaginable computer-related subject, including Lotus products.

According to Hanfbauer, the national Lotus Echo evolved in three stages. Initially, individual bulletin boards around the country supported discrete Lotus discussion areas. By 1986 several regions around the country used FidoNet software to develop regional Lotus Echoes, in which Lotus-related messages were exchanged within a single telephone area code. In 1987 these regional echoes began to merge into the present national Lotus Echo.

A RECURRING THEME ON LOTUS ECHO IS THE QUALITY OF 1-2-3'S COMPETITION.

Lotus Echo is not markedly different in feel from the World of Lotus on CompuServe, and it has the advantage of being free to users. Participating system operators usually pay maintenance costs and telephone charges. Users pay connect charges only if they call a long-distance node. This is usually unnecessary because local nodes act as relays. By contrast, a diligent user of CompuServe can easily run up charges of $1,000 a year.

Most messages on Lotus Echo are requests for assistance. One evening recently, a St. Louis man named Dwayne sent out a call. "*1-2-3* and *Symphony* users! I need your help," he began, then presented his problem in detail. The basic issue—subtracting one column of time values from a second—wasn't that difficult, but solving the formatting and reporting complexities was a thicket.

How 1-2-3 stacks up

Dwayne signed his message, turned off his computer, and called it a night. Within 72 hours, his message had rippled out to hundreds of bulletin boards across the continent. The first response, from a bulletin board in Park Ridge, Ill., included 150-character-long formulas and illustrative techniques to solve the formatting problems. "It's graceless and ugly," wrote the solution's author, Paul Apodoca, "but it's a valid first pass."

In addition to help requests and responses, a recurring theme on Lotus Echo is the quality of *1-2-3*'s competition. "*SuperCalc4* and *Microsoft Excel* got a tremendous amount of discussion when they were released," Hanfbauer says, "and now Borland's *Quattro* is a hot topic."

Anything that Lotus Development Corp. does becomes a conference topic immediately, says Hanfbauer, who notes that he learned of the release of *Speedup* and *Learn* in the conference "before I read about them in the press." There is, Hanfbauer admits, a bit of "Lotus-bashing"—criticism of copy protection, upgrade fees, *1-2-3*'s inability to print graphs directly, the delay of Release 3, and so on. Lotus Echo policy prohibits commercial and inflammatory messages, as well as advocacy of software piracy. But, says Hanfbauer, almost anything else goes.

—Fred Hapgood

CALLING LOTUS ECHO

We can't list every FidoNet node that carries Lotus Echo, but here is a geographically representative sample of those in North America. You can download a complete updated list from almost any node. For more information, write to the International FidoNet Assoc., P.O. Box 41143, St. Louis, MO 63141, or call 314-576-4067.

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Fog Line	Des Moines, Iowa	515-964-7937	9600
Corwin's Keep	Tempe, Ariz.	602-894-1470	9600
The Other BBS	Harrisburg, Pa.	717-657-8699	9600
Viking Magic	Cambridge, Mass.	617-354-2171	2400
Nibbles & Bytes	Dallas, Tex.	214-231-3841	9600
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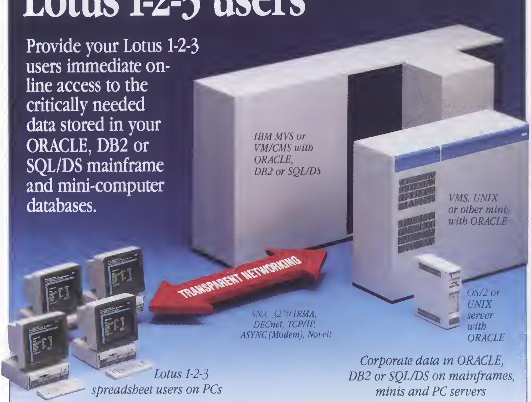
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LOTUSMAGAZINE

PAYING BILLS ELECTRONICALLY

DIANE TESKE HARRIS

An increasing number of banks allow you to do your banking at home, from your PC. If your own bank doesn't, however, you may be interested in a new service from Checkfree Corp. in Columbus, Ohio. Last month Checkfree began offering a consumer banking service that lets individuals and small businesses pay bills electronically, whether or not their banks offer electronic checking.

Once you specify the person or business to be paid, Checkfree's IBM PC or Macintosh software records, categorizes, and sends the information by modem (and a toll-free number) to the Checkfree processing center. Payments from your hometown bank account are sent anywhere in the United States using the Federal Reserve system of transmittal—the system all U.S. banks are tied into.

Checkfree Chairman and CEO Pete Kight says about 65,000 merchants are currently tied into the Checkfree system. Checkfree will transfer funds to participating accounts on whatever date you specify. If an account is not part of the system, the payee will receive a laser-printed check with a copy of your signature within three days. You can also arrange to have Checkfree automatically pay recurring items such as mortgages or car payments. Payments processed by Checkfree appear on your monthly bank statement as normal transactions. The $29.95 startup fee includes the software and the first month's service charge. Thereafter, the monthly service charge is $9 for up to 20 transactions.

A new electronic-banking program, *Accurex* (from Intuit, Palo Alto, Calif.), won't let you pay bills from your PC, but it will help you reconcile your bank statements. The program reads checking account records from your accounting software or Lotus files. It then reconciles them with an on-disk statement you receive from participating banks each month. The software summarizes both cleared and outstanding checks, deposits, and other payments and can reconcile statements of up to 2,500 transactions. Currently, however, there's only one participating bank, First Interstate Bank of California in Los Angeles.

The *Accurex* software is free. After two months, the monthly service charge from your bank is $4.95 per account or 7 cents per transaction, whichever is greater. Intuit President Scott Cook claims that at 500 transactions per minute, *Accurex* is 20 times faster than reconciling by hand.

Now if only someone will come up with a program that puts money *into* your checking account as fast as you can spend it. *—Rich Friedman*

A 20-MB FLOPPY DISK

What do you get when you cross optical disk technology with a conventional floppy disk? The hybrid offspring, dubbed "floptical" disks, have 25 times the capacity of a standard floppy disk. Insite Peripherals (Santa Clara, Calif.) makes a floptical-disk drive that stores up to 20 megabytes of data on a removable, 3½-inch floptical disk.

Increased disk capacity generally requires higher track density. And higher track density requires a more accurate positioning system. An optical servosystem, with its greater positioning accuracy, can pack more than 1,250 tracks on each radial inch of disk surface, compared with the 48 to 135 tracks per inch on a 1.44-megabyte floppy disk.

A floptical disk's closely spaced tracks are inscribed onto the disk with a high-powered laser after ordinary disk manufacturing. The extra step means floptical disks will initially cost about $20 each, but the price may drop as production volume increases. Verbatim and Xidex (under the Dysan label) plan to produce the specially processed media.

Insite's floptical-disk drive uses the standard SCSI (small computer systems interface) employed by many hard disks and by the Macintosh, so the company claims it can be easily integrated into existing and new computers. Insite is concentrating on sales to computer manufacturers, with a price of $250 per unit. When the floptical drive hits retail shelves early next year, it should cost about $500. *—Steve Rosenthal*

PINT-SIZE PC

Laptop computers are unquestionably getting smaller and lighter. Even so, many people still complain that using them is about as much fun as balancing a teacup on one knee and a plate of hors d'oeuvres on the other. Enter the Sharp Wizard, an 8½-ounce PC (including batteries) that fits in a jacket pocket.

The $299 pygmy PC from Sharp Electronics Corp. (Mahwah, N.J.) has 32K of memory, a 16-character-by-8-line LCD, seven resident desktop-type functions, and a tiny slot for ROM/RAM software cards. The software cards currently available include a time/expense management program, a thesaurus/dictionary, and an eight-language translator. In addition, Traveling Software (Bothell, Wash.) sells *Wizard Link*, a program that transfers expense-receipt data from Wizard to a *1-2-3* spreadsheet.

Wizard is surely a marvel of miniature engineering. The question is, however, does anyone really want to type in two weeks' worth of expense data on a keypad about the size of a Post-it note? *—Jennifer Smith*

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1-2-3 MACROS

MAIL CALL

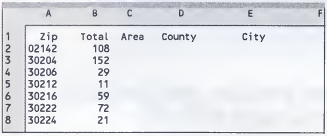
Print from a database, move the cell pointer, and use keyword abbreviations. Your letters reveal more about *1-2-3* macros.

BY NICHOLAS DELONAS AND DANIEL GASTEIGER

We receive more mail on Macros than we can deal with in a small space at the end of this department. So once again, we devote an entire department to a representative selection of those letters.

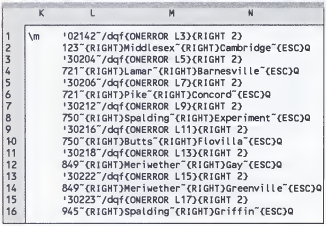
ZIP CODE MACRO NEEDS MORE ZIP

Our company produces a printout of the number of units sold in a particular geographical area. Each quarter we download a print file to a PC and import the file into a Release 2.01 worksheet. Then we parse the data and use it in creating a database. The following figure shows the parsed data in the database:



	A	B	C	D	E	F
1	Zip	Total	Area	County	City	
2	02142	108				
3	30204	152				
4	30206	29				
5	30212	11				
6	30216	59				
7	30222	72				
8	30224	21				

I wrote the macro below to enter information in columns C, D, and E under the headings shown. The macro plugs a zip code into a Criterion range, searches the new database for the zip code, and enters information in the row of the database that contains the zip code. The information that we download changes from quarter to quarter, and some of the zip codes in the macro may not be in the imported data. If so, the macro should plug in another zip code and repeat the search procedure.



```
      K        L                   M                   N

1     \m       '02142~/dqf{ONERROR L3}{RIGHT 2}
2              123~{RIGHT}Middlesex~{RIGHT}Cambridge~{ESC}Q
3              '30204~/dqf{ONERROR L5}{RIGHT 2}
4              721~{RIGHT}Lamar~{RIGHT}Barnesville~{ESC}Q
5              '30206~/dqf{ONERROR L7}{RIGHT 2}
6              721~{RIGHT}Pike~{RIGHT}Concord~{ESC}Q
7              '30212~/dqf{ONERROR L9}{RIGHT 2}
8              750~{RIGHT}Spalding~{RIGHT}Experiment~{ESC}Q
9              '30216~/dqf{ONERROR L11}{RIGHT 2}
10             750~{RIGHT}Butts~{RIGHT}Flovilla~{ESC}Q
11             '30218~/dqf{ONERROR L13}{RIGHT 2}
12             849~{RIGHT}Meriwether~{RIGHT}Gay~{ESC}Q
13             '30222~/dqf{ONERROR L15}{RIGHT 2}
14             849~{RIGHT}Meriwether~{RIGHT}Greenville~{ESC}Q
15             '30223~/dqf{ONERROR L17}{RIGHT 2}
16             945~{RIGHT}Spalding~{RIGHT}Griffin~{ESC}Q
```

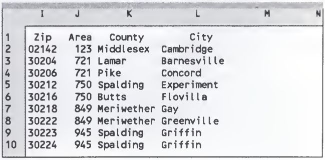
When the macro performs a Data Query Find operation with a zip code that doesn't exist in the imported data, however, the macro goes haywire. Apparently, you can use an {ONERROR} command only once per macro. To avoid the problem, I visually review the new downloaded zip codes before I run the macro. I delete from the macro any zip codes that are not in the imported data.

How can I write this macro without using the {ONERROR} command? When the zip code doesn't exist, the macro should skip the steps that enter data and look in the database for the next zip code.

Joe Yeager
Macon, Ga.

The editor replies: In fact, you can have more than one {ONERROR} command in a macro. You can have as many as you like. Each one merely supersedes the one before it. The problem is that an error doesn't arise when the Data Query Find command can't locate records that match the specified criteria.

Fortunately, you don't even need a macro to solve your problem. Set up a second database, as we've shown in range I1..L10 of the following figure, that lists all possible zip codes and the corresponding data for the *Area, County*, and *City* columns. Be sure to



	I	J	K	L	M	N
1	Zip	Area	County	City		
2	02142	123	Middlesex	Cambridge		
3	30204	721	Lamar	Barnesville		
4	30206	721	Pike	Concord		
5	30212	750	Spalding	Experiment		
6	30216	750	Butts	Flovilla		
7	30218	849	Meriwether	Gay		
8	30222	849	Meriwether	Greenville		
9	30223	945	Spalding	Griffin		
10	30224	945	Spalding	Griffin		

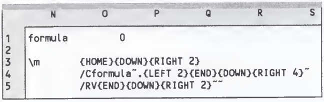
enter zip codes as labels in this new database to match the zip code labels in the imported data.

Use the Range Name Create command to assign the name *dbase* to the range that contains the new database, range I1..L10. In cell O1 enter the following formula, but don't mind that it initially returns ERR:

@VLOOKUP($a1,$dbase,@CELL("col",N1) – 1')

Copy cell O1 to the cells you wish to fill, range C2..E8, in your example. Finally, select /Range Value, indicate range C2..E8 as the range to copy from, then indicate cell C2 as the range to copy to.

If you must use a macro, try this one:



```
       N          O          P          Q          R          S
 1  formula          0
 2
 3  \m         {HOME}{DOWN}{RIGHT 2}
 4             /Cformula~.{LEFT 2}{END}{DOWN}{RIGHT 4}~
 5             /RV{END}{DOWN}{RIGHT 2}~~
```

When you create the macro, leave the formula you wrote previously in cell O1. Enter labels in columns N and O as shown, then use the Range Name Labels Right command to assign the labels in column N as names for the adjacent cells of column O.

To run the macro, hold down the MACRO key (Alt on most computers) and press M. Here's what the macro does:

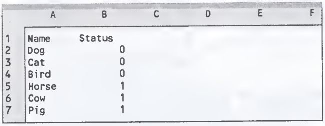
{HOME}{DOWN}{RIGHT 2} Positions the cell pointer in the first blank cell in the database (C2).

/Cformula~.{LEFT 2}{END}{DOWN}{RIGHT 4}~ Copies the formula from cell O1 to the blank cells in the database. In this case, the command copies the formula to range C2..E8.

/RV{END}{DOWN}{RIGHT 2}~~ Changes the copied formulas into values.

DYNAMIC PRINT RANGES

I have a *1-2-3* database sorted by numbers in column B, which may contain any number of zeros, followed by any number of ones, followed by blank rows.

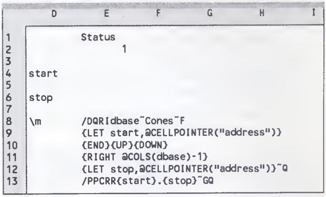


```
       A          B          C          D          E          F
 1  Name       Status
 2  Dog             0
 3  Cat             0
 4  Bird            0
 5  Horse           1
 6  Cow             1
 7  Pig             1
```

I need a macro that prints only the records that have a 1 in column B. In this example, the macro should print range A5..B7. Do you have any suggestions?

R. G. Warner
Cary, N.C.

The editor replies: The following Release 2/2.01 macro prints every record whose entry in column B is the number 1:



```
       D          E          F          G          H          I
 1             Status
 2                  1
 3
 4  start
 5
 6  stop
 7
 8  \m         /DQRIdbase~Cones~F
 9             {LET start,@CELLPOINTER("address")}
10             {END}{UP}{DOWN}
11             {RIGHT @COLS(dbase)-1}
12             {LET stop,@CELLPOINTER("address")}~Q
13             /PPCRR{start}.{stop}~GQ
```

To use the macro, enter labels as shown, and enter the number 1 in cell E2. Use the Range Name Create command to assign the name *ones* to range E1..E2. Use the Range Name Labels Right command to assign the labels in column D as names for the adjacent cells of column E. Finally, assign the name *dbase* to the range that contains your database (A1..B7). The macro is ready to fly.

To run the macro, hold down the MACRO key and press M. Here's what happens:

/DQRIdbase~Cones~F Selects /Data Query Reset Input and indicates *dbase* as the Input range. Then the macro selects Criterion, indicates *ones* as the Criterion range, and selects Find. *1-2-3* highlights the first of the appropriate records in the database.

{LET start,@CELLPOINTER("address")} Stores in *start* (cell E4) the address of the leftmost cell of the located record.

{END}{UP}{DOWN} Highlights the last of the records that match the criterion. When the macro presses the End key, the database highlight jumps to the last record in the database, whether or not that record matches the data-query criterion. The macro presses UpArrow followed by DownArrow to insure that the database highlight rests on the last of the matching records.

{RIGHT @COLS(dbase) – 1} Moves the cursor that identifies the current cell to the last column in *dbase*. Using this command rather than a simple {RIGHT} command insures that the macro will work even if you insert several database fields between the *Name* and *Status* fields.

{LET stop,@CELLPOINTER("address")}~Q Stores the address of the cell pointer in *stop* (cell E6). Then ends the Query Find operation and returns *1-2-3* to Ready mode.

/PPCRR{start}.{stop}~GQ Prints the range whose corner cells are identified by the labels in the cells named *start* and *stop*. In this case, the macro prints range A5..B7.

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CIRCLE 108 ON READER SERVICE CARD

1-2-3 MACROS *continued from page 23*

LOOKING FOR A CELL REFERENCE

I work with large spreadsheets and find it hard to remember the contents of cells referred to by formulas or macros. I use the following macro to look at a cell, then return to my starting point:

```
         A          B          C          D          E
 1   \L         /RNChere~~
 2              {GOTO}{?}~
 3              {?}{ESC}
 4              {GOTO}here~
 5              /RNDhere~
```

To create the macro, enter labels as shown and assign the name \l to cell B1. Then, at any point when *1-2-3* is in Ready mode, you can run the macro by holding down the MACRO key and pressing L. Here's what the macro does:

/RNChere~~ Assigns the range name *here* to the current cell.

{GOTO}{?}~ Prompts you for a cell address or range name, then moves the cell pointer to the cell you identify.

{?}{ESC} Causes the macro to pause until you press Return, then presses Escape in case you've pressed the EDIT key.

{GOTO}here~ Returns the cell pointer to the cell that was current when you started the macro.

/RNDhere~ Deletes the range name *here*.

J. Ignacio Lulli
Cambridge, Mass.

The editor replies: This technique works well for Release 1A, but remember not to use the range name *here* anywhere in your worksheet or the macro won't return the cell pointer to the proper cell. Users of *1-2-3* Release 2/2.01 might prefer to use the following macro, which runs faster and eliminates much of the screen's "flicker" caused by the Release 1A macro:

```
         A          B          C          D          E          F
 1   \l         {LET here,@CELLPOINTER("address")}
 2              {GOTO}{?}~
 3              {?}{ESC}
 4              {GOTO}{here}~
 5
 6   here
```

Create this macro as you did the previous one by entering labels as shown and assigning the labels in column A as names for the adjacent cells of column B. Again, run the macro only when *1-2-3* is in Ready mode. Here's what the macro does:

{LET here,@CELLPOINTER("address")} Places in *here* a label that depicts the current cell's address.

{GOTO}{?}~ Prompts you to identify the cell that you wish to examine, then moves the cell pointer to that cell.

{?}{ESC} Causes the macro to pause until you press Return, then presses Escape in case you've pressed EDIT to help analyze formula references.

{GOTO}{here}~ Presses the GOTO key, calls *here* as a subroutine, and presses Return. This returns the cell pointer to the cell whose address the macro stored earlier in the cell named *here*.

DON'T WRITE A {RIGHT}

Instead of typing the commands {RIGHT}{RIGHT}{RIGHT} or {DOWN}{DOWN}{DOWN}, simply type {R 3} or {D 3}. The shorter commands work the same as the longer ones and are easier to write. You can also use this technique for the {LEFT} and {UP} commands.

Theresa Ruscio
Spokane, Wash.

The editor replies: Your suggestion is a good one. Note, however, that this shortcut doesn't work in *1-2-3* Release 1A.

A BETTER PRINT MACRO

I've wasted a lot of time trying to use a macro to specify a setup string prior to printing a named range. I created a macro that will enter a setup string, replacing an existing string if one exists:

	A	B	C	D	E	F
1	\p	/PPRrange~OS9{ESC}\015~QAGQ				

The commands /PPRrange~ in this macro assign *range* as the Print range. The commands OS9{ESC}\015~QAGQ select Options Setup, type *9*, press Escape, type *\015*, press Return, and select Quit Align Go Quit. When the macro selects Options Setup, there may not be a default string present on the command line after the prompt *Enter Setup String*. By typing *9* at the prompt, the macro supplies a dummy setup string. Then when the macro presses Escape, rather than backing up to the previous menu, *1-2-3* simply clears the dummy setup string. The macro then enters the proper setup string and prints *range*.

THAT PESKY NUMLOCK KEY

Can you invoke the NumberLock key within a macro?

R D. Liddle
Rockwell International
DuBois, Pa.

The editor replies: If you mean, can a *1-2-3* macro press the NumberLock key, the answer is no. You, however, can press the key while a macro is running. I'd be surprised if there isn't a background program you can buy that would give your macros access to the NumberLock key. How about it? Have any readers found a way to get a macro to press NumLock? If anyone can supply a workable and legal technique, we'll report on it in an upcoming column.

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PRESSING THE SELECT KEY

I have a Hewlett-Packard 150 and *1-2-3* Release 2.01. I can't figure out how to use the Select key in a macro. When I press Select followed by a cursor-movement key, the cell pointer jumps to the end of the current block of data. Is there a way to do this in a macro?

George Trussell
McMath, Trussell & Turner Construction Co.
Columbus, Ga.

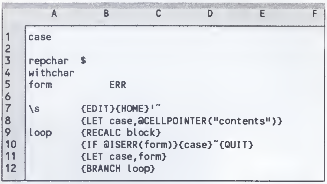
The editor replies: Apparently, Hewlett-Packard's Select key is analogous to IBM's End key. Use the {END} keyword to have your macro press the Select key.

FROM ABSOLUTE TO RELATIVE

I use absolute cell references to make copying formulas easier. However, I often need to convert absolute references to relative references once I've copied the formulas. It's easy to write a macro that removes absolute reference indicators ($) from specific formulas. Is there a macro that removes that symbol from any formula?

Philip Sauber
Beaumont, Tex.

The editor replies: I just wrote one, and it's useful to anyone who wants to alter characters in cell entries. The following Release 2/2.01 macro removes absolute value signs from a formula:



```
        A         B         C         D         E         F
1   case
2
3   repchar  $
4   withchar
5   form          ERR
6
7   \s       {EDIT}{HOME}'~
8            {LET case,@CELLPOINTER("contents")}
9   loop     {RECALC block}
10           {IF @ISERR(form)}{case}~{QUIT}
11           {LET case,form}
12           {BRANCH loop}
```

To use the macro, enter labels as shown, omitting the entry in cell B5, which is a formula that you'll enter in a moment. Note that you must begin the entries in cells B3 and A7 with an apostrophe label-prefix character, or you may get unexpected results. Also, enter an apostrophe in cell B4. The cell will appear blank, but it will actually contain a null string.

Use the Range Name Labels Right command to assign the labels in column A as range names for the adjacent cells of column B. Then use the Range Name Create command to assign the name *block* to range B1..B5. Finally, enter the formula @REPLACE(case, @FIND(repchar,case,0),1,withchar) into the cell named *form* (B5). Never mind that the formula returns ERR.

To see the macro in action, write a formula that contains several absolute references. For example, enter the formula +$D$17+E$20+@SUM($F$1..F3) into cell B15. Then, with the cell pointer in cell B15, run the macro by holding down the MACRO key and pressing S. Here's what happens:

{EDIT}{HOME}'~ Converts the formula in the current cell into a label.

{LET case,@CELLPOINTER("contents")} Copies from the current cell to the cell named *case*.

{RECALC block} Recalculates the formula in *form* based on the new label stored in *case*. The formula in *form* uses the @REPLACE function to remove the first $ from the label in *case*. In our example, the first time *1-2-3* processes this command, *case* contains the label +$D$17+E$20+@SUM($F$1..F3), and the formula in *form* returns +D$17+E$20+@SUM($F$1..F3).

{IF @ISERR(form)}{case}~{QUIT} Determines whether the formula in *form* returns ERR. If *form* does return ERR, this step calls *case* as a subroutine, which results in *1-2-3* typing the contents of *case* in the control panel. Then the macro presses Return to enter the new formula into the current cell and the macro stops. If *form* doesn't return ERR, macro control passes directly to the command in cell B11. In our example, the first time *1-2-3* processes this line of code, *case* doesn't return ERR.

{LET case,form} Copies the result of the formula in *form* to the cell named *case*. This replaces the original label version of the formula with a label version that lacks the first of its absolute value signs.

{BRANCH loop} Transfers macro control to the cell named *loop* (cell B9). The macro once again recalculates the formula in *form* based on the new label in *case*. On the second pass of the macro in this example, the cell named *case* contains the label +D$17+E$20+@SUM($F$1..F3), and *form* returns the string +D17+E$20+@SUM($F$1..F3). The formula in *form* will return ERR when there are no more absolute value signs in the label in *case*.

The macro's operation isn't as confusing as it seems. In summary, the formula in *form* removes a single absolute value sign from the string in *case*. The macro repeatedly copies the formula's result into *case* until there are no more absolute value signs in the label. Then the macro enters the new formula into the current cell—the cell from which the macro copied the original formula.

If you wish to strip characters from label or numeric entries, simply replace the absolute value sign in *repchar* with the character you wish to strip. Or if you wish to replace characters in cell entries, enter into *repchar* the character to eliminate. Then enter in *withchar* the replacement character or characters. For example, to replace with slashes the dashes in a date label, enter a minus sign in *repchar* and enter a slash in *withchar*. Place the cell pointer over the date label, and run the macro. The macro will convert the label *3-6-88* to *3/6/88*. ■

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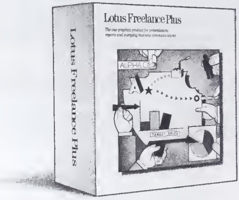
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CIRCLE 110 ON READER SERVICE CARD

SYMPHONY MACROS

FROM THE MAIL BAG

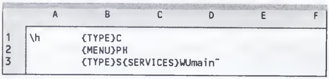
Use multiple criteria, hang up the telephone, and set Print ranges. Your letters provide further insights into *Symphony* macros.

BY DANIEL GASTEIGER

As always, it's difficult to keep up with the mail. The letters in this month's column date back to the early months of the year. They are, however, representative of the mail that we receive, and they provide opportunities to explore several topics of general interest.

HANGING UP

I usually use the following macro to end a *Symphony* communications session:



```
      A        B        C        D        E        F
1   \h         {TYPE}C
2              {MENU}PH
3              {TYPE}S{SERVICES}WUmain~
```

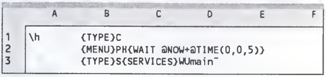
The macro always works when I use it independent of other code. However, when I use the routine as a part of a longer macro, it never seems to hang up the phone. Can you identify the source of this problem?

Joseph Bennett
Salt Lake City, Utah

The editor replies: I can only guess. I've wrestled with this problem many times, and I still haven't found a foolproof solution.

Apparently, *Symphony*'s macro processor outruns the COMM window's Phone Hangup command. By the time your modem tries to hang up the phone, your macro is telling *Symphony* to do other things; the modem never finishes hanging up.

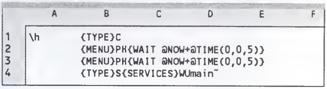
You can improve the performance of your routine by making the macro pause after it issues the MENU Phone Hangup sequence. To make the macro pause, include a {WAIT} command as shown below:



```
      A        B        C        D        E        F
1   \h         {TYPE}C
2              {MENU}PH{WAIT @NOW+@TIME(0,0,5)}
3              {TYPE}S{SERVICES}WUmain~
```

The command {WAIT @NOW+@TIME(0,0,5)} causes the macro processor to pause for five seconds, which may be enough time for your modem to hang up the phone. However, I've included significant pauses in macros that need to hang up the phone, and those pauses haven't always done the job.

If one pause doesn't work for your macros, try adding a second {MENU}PH sequence to the macro as shown below:



```
      A        B        C        D        E        F
1   \h         {TYPE}C
2              {MENU}PH{WAIT @NOW+@TIME(0,0,5)}
3              {MENU}PH{WAIT @NOW+@TIME(0,0,5)}
4              {TYPE}S{SERVICES}WUmain~
```

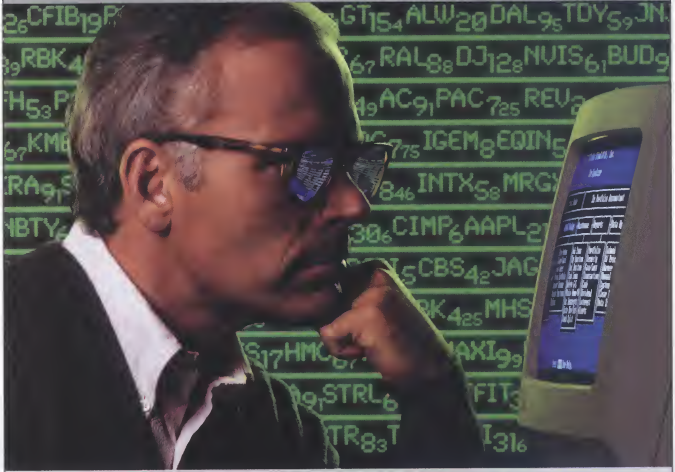
Doubling commands may seem excessive, but it rarely fails to hang up the phone. I used this technique in the macro presented in the August *Symphony* Macros column.

MACRO-WRITTEN CRITERION FORMULAS

I have a problem putting dates into the Criterion range of the *Symphony* database shown in columns A and B of the worksheet on the following page.

MARILYN CATHCART

ANNOUNCING VERSION 2.0



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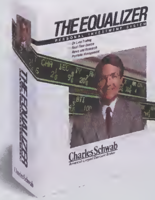

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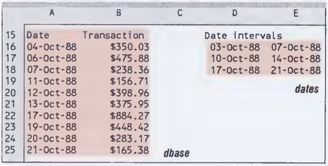


```
         A               B           C          D            E
15  Date        Transaction              Date intervals
16  04-Oct-88       $350.03               03-Oct-88   07-Oct-88
17  06-Oct-88       $475.88               10-Oct-88   14-Oct-88
18  07-Oct-88       $238.36               17-Oct-88   21-Oct-88
19  11-Oct-88       $156.71
20  12-Oct-88       $398.96
21  13-Oct-88       $375.95
22  17-Oct-88       $884.27
23  19-Oct-88       $448.42
24  20-Oct-88       $283.17
25  21-Oct-88       $165.38
```

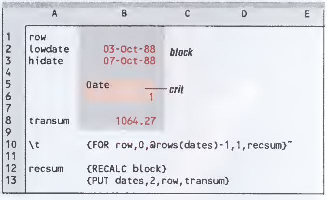
I want a macro to sum in cell F16 the transactions that fall between the dates listed in cells D16 and E16. Then the macro should sum in cell F17 the transactions that fall between the dates in cells D17 and E17. The macro should continue this summing procedure for all date pairs listed in columns D and E. There are only three date pairs shown in this example, but the worksheet I work with might contain as many as 1,000 pairs.

I've tried several approaches, but the only one that seems to work is esoteric at best. When it comes to programming, I've always felt that if what you're doing starts looking baroque, you're missing something fundamental. Do you have any ideas?

Glenn Stone
Briarcliff Manor, N.Y.

The editor replies: I omitted from this discussion the criterion formulas you described in your letter. The fundamental concept your formulas lack is that criterion formulas can refer to cells other than those in the first row of the database.

I took the liberty of writing a complete macro that calculates subtotals as you've requested. Unfortunately, the techniques I've used fit the definition of esoteric. Let's build the model, then use it to explore the criterion formulas you probably wanted to write.



```
         A             B              C           D            E
1   row
2   lowdate        03-Oct-88
3   hidate         07-Oct-88
4
5              Oate
6                          1
7
8   transum          1064.27
9
10  \t         {FOR row,0,@rows(dates)-1,1,recsum}~
11
12  recsum     {RECALC block}
13             {PUT dates,2,row,transum}
```

Start in a blank worksheet and set column widths as follows: A–10, B–13, D–11, and E–11. Enter the labels shown in the previous figure, and use the @DATE function to enter the dates shown in columns A, D,

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and E. Enter the values shown in column B, then select MENU Format Date 1 to format ranges B2..B3, A16..A25, and D16..E18. Select MENU Format Currency to format range B16..B25.

Enter the labels shown in the previous figure, but omit the entries shown in red, which are formulas you'll enter in a moment.

Select MENU Range Name Labels Right, and indicate range A1..A12 to assign the labels in column A as names for the adjacent cells of column B. Then select MENU Range Name Create to assign the following range names:

Name	**Range**
block	B1..B8
crit	B5..B6
dbase	A15..B25
dates	D16..F18

Finally, enter the label *Sums* into cell F15, and enter formulas as shown in the table:

Cell	**Formula**
B2	@INDEX(dates,0,row)
B3	@INDEX(dates,1,row)
B6	+A16>=$lowdate#AND#A16<=$hidate
B8	@DSUM(dbase,1,crit)

Your worksheet should match the ones we've shown.

The formulas in *lowdate* and *hidate* use the @INDEX function to return date values from the table named *dates*, which contains date intervals. The formula @INDEX(dates,0,row) in *lowdate* means "return the value that is 0 columns to the right and *row* rows down from the top-left cell of the range named *dates*." *Row* is blank and so has the value of 0. At the moment, the function returns the date from the top-left cell of *dates*. Likewise, the formula in *hidate* returns the date from the top-right corner cell of *dates*.

The formulas in *lowdate* and *hidate* rely on the value of *row* to determine which date pairs to return from the table of date intervals. This means you can make the formulas return a different date pair simply by changing the value of *row*. Enter the value 1 into *row* (cell B1) and watch the formulas in *lowdate* and *hidate* change to display the dates October 10, 1988, and October 14, 1988. Then enter the value 2 into *row* and watch the formulas change once more.

The criterion formula in cell B6 refers to the cells named *lowdate* and *hidate*. That formula reads +A16>=$lowdate#AND#A16<=$hidate and means "select every entry whose date is greater than or equal to the date in *lowdate* and is less than or equal to the date in *hidate*."

The formula in *transum* uses the @DSUM function to sum transactions for all records that match the cri-

terion. While *row* equals 2, as it now does, the formula in *transum* totals the transactions that fall between October 17 and October 21, inclusive. Change the value of *row* to 0 and *transum*'s formula totals the transactions that fall between October 3 and October 7.

The macro uses a {FOR} command to increase the value of *row*, recalculate the formulas, and record the value of *transum* that results with each increase in *row*'s value. To try the macro, hold down the MACRO key (Alt on most computers) and press T. In moments the subtotals appear in column F. Never mind that the worksheet's formulas return ERR. They will return real values if you reset the value of *row* to 0.

I didn't use *Symphony*'s Generate command to create the database used in this discussion. As I've designed it, the macro and its formulas seem as though they must interfere with the Criterion range that *Symphony* creates along with a data-entry form. This isn't the case. You can create the entire macro with all its supporting formulas out of the way of a database's default Definition, Criterion, Report, and other related ranges. The macro and its formulas rely on none of the default ranges.

SYMPHONY: A WORD PROCESSOR?

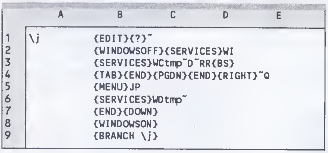
As a user of *1-2-3*, I used a macro printed in your May 1985 issue. That macro uses *1-2-3*'s Range Justify command to fit text within a specified column width.

I've recently converted to *Symphony*, and now I miss the *1-2-3* macro. I want to be able to write explanations within the worksheet and justify them easily. Is there any way to do this?

A. E. Small
Old Evansville Antique Mall
Evansville, Ind.

The editor replies: I think that *Symphony*'s designers thought you'd use the DOC window when you want to justify text. That's probably why they omitted the Range Justify command. If you enter text in the leftmost column of the current window, simply press the TYPE key and select DOC. Type the text, and *Symphony* justifies as you go. When you finish, press the SWITCH key to return to the worksheet.

If changing window types to justify text doesn't satisfy your needs, try the following macro:



```
        A          B          C          D          E
1   \j         {EDIT}{?}~
2              {WINDOWSOFF}{SERVICES}WI
3              {SERVICES}WCtmp~D~RR{BS}
4              {TAB}{END}{PGDN}{END}{RIGHT}~Q
5              {MENU}JP
6              {SERVICES}WDtmp~
7              {END}{DOWN}
8              {WINDOWSON}
9              {BRANCH \j}
```

To use the macro, enter labels as shown and assign the range name \j to cell B1. Then, with the cell pointer in any column, run the macro by holding down the MACRO key and pressing J. The *Macro* indicator appears at the bottom of your display.

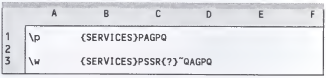
Type until the text you're entering begins to scroll across the edit line in the control panel, then press Return. *Symphony* justifies the text into a block, positions the cell pointer on the last line of the block, and leaves the worksheet in Edit mode so that you can continue typing at the point where you left off.

Sometimes when you press Return, *Symphony* deposits the cell pointer at the bottom of the worksheet. If this happens to you, press UpArrow End UpArrow EDIT, and you're ready to continue typing. If you wish to begin a new block of text after you justify the current block, press DownArrow twice and continue typing. To stop the macro, press the Break key (on most computers, hold down the Control key and press Break), then press Escape to clear the resulting error.

This macro almost exactly duplicates the *1-2-3* macro from the May 1985 issue of *LOTUS*. The *Symphony* version is longer and slower than the *1-2-3* version.

A PRINTING UTILITY

The printing utility you presented in your June column is similar to one I've been using for some time. The following illustration shows your macro in cell B1 and my macro in cell B3:



```
        A          B          C          D          E          F
1   \p         {SERVICES}PAGPQ
2
3   \w         {SERVICES}PSSR{?}~QAGPQ
```

Yours works well in a DOC window, but it's awkward in a SHEET window. The macro I use works as well in a SHEET window as it does in a DOC window.

Your macro presses SERVICES and selects Print Align Go Page-Advance Quit. This prints the contents of the current DOC window unless there is already a Print range defined. If a Print range is defined, your macro prints that range no matter what type of window is current.

My macro selects SERVICES Print Settings Source Range and pauses so that I can indicate the range that I want to print. This lets me print easily, no matter what type of window is current.

W. M. Morgan
Keithville, La.

The editor replies: One advantage of printing from a DOC window is in not having to indicate a Print range. For people who enjoy that advantage, as I do, your macro causes undo frustration. If you print only from within a SHEET window, your macro is indispensable. However, if you also print from a DOC window, consider using both your macro and the one from the June issue. If you use both macros, include commands in your macro to cancel the Print range after the range is printed. The modified macro would read {SERVICES}PSSR{?}~QAGPSSCQQ. ■

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The world wasn't waiting. We were. The PC makes its debut.

It also launched a company that immediately assumed center stage in the exciting new world of personal computing. The company was Microsoft, and the tenet upon which it was founded was a simple one. To see a computer on every desk and in every home.

To take that rudimentary new contraption that was the early personal computer and turn it into the powerful machine that has literally changed the way we work, required some important steps. The first order of business was to create not simply products, but standards. Microsoft® BASIC became the first universal programming language for the personal computer. And set a standard upon which an industry could grow.

Next came what is now the world standard PC operating system, MS-DOS®, developed by us and chosen by IBM for its first personal computers. Today, 20 million machines run on it, and so does a billion-dollar software industry.

And when the Macintosh® was being developed, we were there. That early participation allowed us to write its richest and most important software. These crucial pieces include the powerful Microsoft Word, the much-applauded Microsoft Excel, and Microsoft Works, the single-solution program for the diverse needs of small business.

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As we were contributing to the development of the Mac®, we were also developing a system to put graphics interface technology into the world of IBM® PCs and compatibles.

The introduction of Microsoft Windows in 1985 meant that an easy-to-understand desktop graphical environment now appeared on PCs. Ultimately, this friendly screen will forever replace the cold theater of character-based computing.

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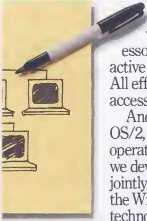
MS-DOS with Windows. Mac. MS OS/2. Three ways to go. One driver. Microsoft.

final focus that original Microsoft vision. Through Windows, any number of software applications will seamlessly integrate. Sophisticated spreadsheet programs. Powerful word processors. Interactive databases. All effortlessly accessible.



riving the network.

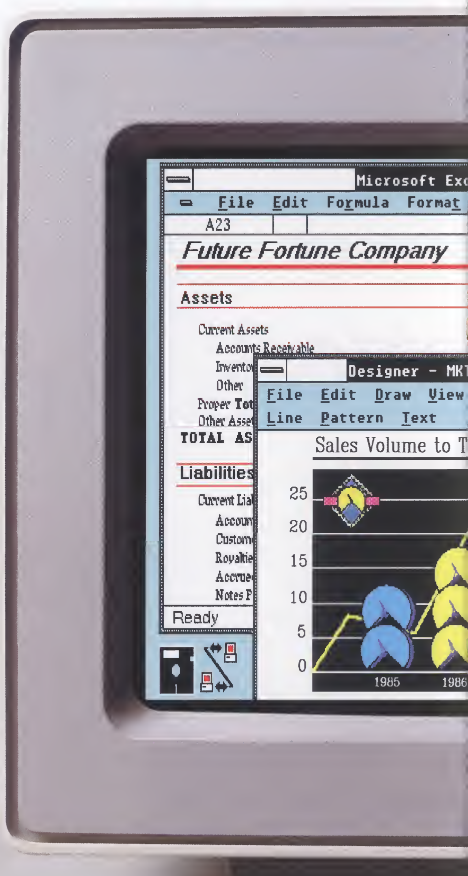
And in MS® OS/2, the new operating system we developed jointly with IBM, the Windows technology (called Presentation Manager) gets even more exciting. Opening up mega-amounts of power and memory. Opening up your screen to do several tasks at once. And opening up endless possibilities for developers using the Microsoft family of languages.

But all this doesn't end at the desktop. With Microsoft OS/2 LAN (local area network) Manager, it's as easy and natural to work on a network as it is to work alone.

By linking users via software, information can be shared and exchanged by members of a group. Projects are worked on together, instead of bit by bit. And it's amazing how a company communicates once it's joined by electronic mail.

There is no question that the advanced productivity springing from today's personal computer is the direct result of our continued commitment to superior technology.

But even so, that's only half of the equation.



MAKE SENSE

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working with pictures makes the work you turn out much more interesting. Which is why the introduction of Microsoft Windows to the IBM PC and compatibles brought with it a whole new category of software with impressive credentials. Like desktop publishing. And presentation applications that let you create a sophisticated graphics show, from your office instead of the art studio's.

With Windows giving laser printers their marching orders, all manner of documents take on a more finished look. And no matter what application you're using, Windows will take over the job of running your printer.

There is also a hardware complement to graphical applications: the Microsoft Mouse. An unprecedented 1.5 million users have found that a simple point and click eliminates complicated keyboard commands.

Our Windows spreadsheet program, Microsoft Excel, goes so far beyond just simple number-crunching that it has received unparalleled acceptance in corporate America. More powerful than any other, it also easily delivers sophisticated charts, graphs, text and data pulled simultaneously from several sources. And to make it even easier, we built it to graciously accept files and macros from other programs.

The Fortune Teller

Future Fortune Company

Corporate Cookie Standards, rolling in the dough

Old sayings may cost Future Fortune

New fortunes for the month of August

WYSIWYG, as in What You See Is What You Get. No translation needed.

The new generation of PCs will run OS/2 with Presentation Manager, taking our graphical screen to even greater heights. By unlocking the capability of these machines, users can easily switch between programs almost instantly. Members of a workgroup can work together on an unlimited number of tasks.

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And finally, every kind of program, from spreadsheets to electronic mail to word processing, works in a common way. To the user, learning one is a quick step toward learning them all. To the corporate bottom line, it means far less valuable time and money are spent on training.

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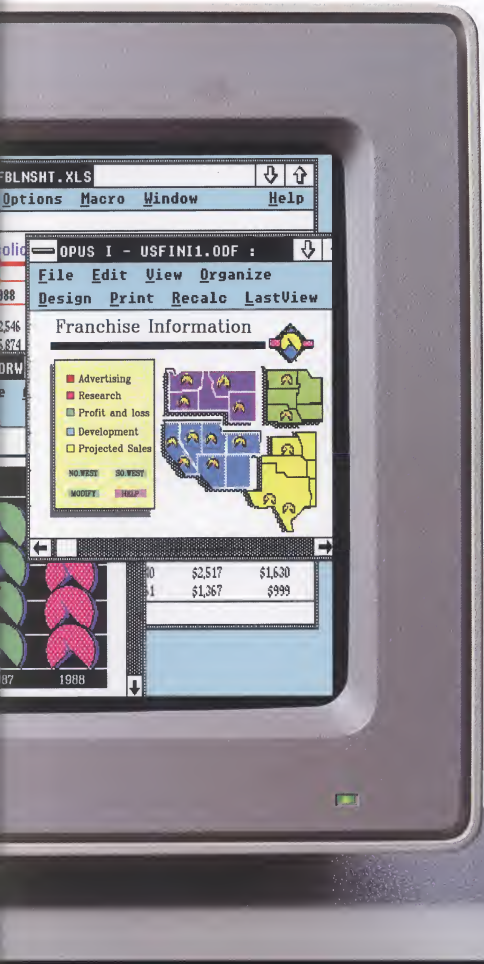
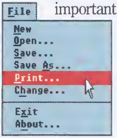


The philosophy behind Microsoft includes another, equally important, notion. That all the technology in the world doesn't add up to a hill of beans unless it is practical, useful and, above all, easy.



Easy commands from pull-down menus make window-shopping easy.

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For the first in a series of articles detailing Bill Gates' perspectives on personal computing into the 1990s, call Microsoft at (800) 323-3577.
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MANAGING FOREIGN-CURRENCY RISK

If you do business in other countries, here's how to counter the effects of shifting exchange rates.

BY STEPHEN L. NELSON

When a company conducts its business in more than one currency, it is exposed to risks because currency exchange rates can shift. It's not easy to manage these risks, for a couple of reasons. First, many available accounting systems don't recognize multiple-currency transactions. Second, many systems don't provide a way to see, on a companywide basis, the effect of changing exchange rates on profits.

To measure these effects, you must compare the amount you owe in another currency (from your accounts payable and loan-and-lease ledgers) with how much you are owed in that currency (from your accounts receivable and investment ledgers). Your financial-management systems may not provide you with convenient ways to do this, but you can construct a *1-2-3* or *Symphony* worksheet that measures and helps you manage your foreign-currency exposure. The worksheets described here will work in any release of *1-2-3* or *Symphony*; the only limitation is that you can't create foreign-currency characters, such as the Japanese yen symbol (¥), in *1-2-3* Release 1A.

Suppose you are an importer of sports clothing from the Pacific Rim and Asia. Every three or four months you go to Japan, where you review the latest offerings in a Tokyo warehouse. After making your decisions, you contract to buy, for yen, what you believe will sell in the United States for dollars. Between the time you make the contract and the time you pay for the merchandise, the yen could increase against the dollar (that is, a dollar will buy fewer yen). If this happens, you will pay more for the merchandise than the price you negotiated. Of course, if the yen decreases against the dollar (a dollar buys more yen), you will effectively pay less for the merchandise.

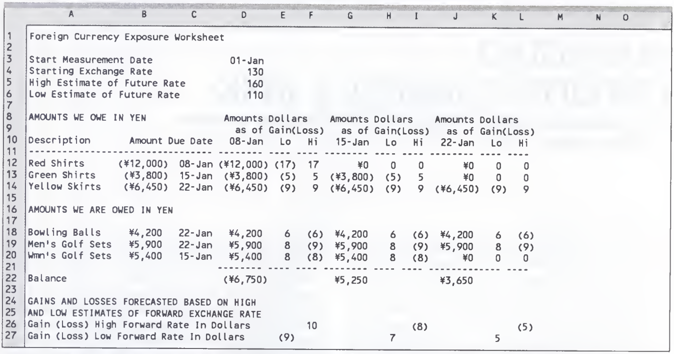
Now suppose that when you make your trips to Japan, you attempt to sell sporting goods made by one of your subsidiary firms. On your last trip, you managed to get several orders for bowling and golf equipment, and you agreed to accept payment in yen. Here you have the reverse problem. You've negotiated a selling price that gives you a profit, but if the yen *decreases* against the dollar before you get paid, your

---

Stephen L. Nelson, CPA, is a consultant in Seattle, Wash., and author of the Small-Business Series that appeared in the May through October issues.

MARILYN CATHCART

FINANCE *continued from page 41*



```
           A                B          C        D       E    F       G       H    I       J       K    L      M      N    O

1   Foreign Currency Exposure Worksheet
2
3   Start Measurement Date                   01-Jan
4   Starting Exchange Rate                      130
5   High Estimate of Future Rate                160
6   Low Estimate of Future Rate                 110
7
8   AMOUNTS WE OWE IN YEN                   Amounts Dollars     Amounts Dollars     Amounts Dollars
9                                             as of Gain(Loss)    as of Gain(Loss)    as of Gain(Loss)
10  Description        Amount Due Date       08-Jan   Lo   Hi    15-Jan   Lo   Hi    22-Jan   Lo   Hi
11  ------------------------------- -------- ---- ---- -------- ---- ---- -------- ---- ----
12  Red Shirts      (¥12,000)  08-Jan (¥12,000) (17)   17        ¥0    0    0        ¥0    0    0
13  Green Shirts     (¥3,800)  15-Jan  (¥3,800)  (5)    5  (¥3,800)  (5)    5        ¥0    0    0
14  Yellow Skirts    (¥6,450)  22-Jan  (¥6,450)  (9)    9  (¥6,450)  (9)    9  (¥6,450)  (9)    9
15
16  AMOUNTS WE ARE OWED IN YEN
17
18  Bowling Balls      ¥4,200  22-Jan    ¥4,200    6  (6)    ¥4,200    6  (6)    ¥4,200    6  (6)
19  Men's Golf Sets    ¥5,900  22-Jan    ¥5,900    8  (9)    ¥5,900    8  (9)    ¥5,900    8  (9)
20  Wmn's Golf Sets    ¥5,400  15-Jan    ¥5,400    8  (8)    ¥5,400    8  (8)        ¥0    0    0
21                                     -------- ---- ---- -------- ---- ---- ------------- ----
22  Balance                            (¥6,750)              ¥5,250              ¥3,650
23
24  GAINS AND LOSSES FORECASTED BASED ON HIGH
25  AND LOW ESTIMATES OF FORWARD EXCHANGE RATE
26  Gain (Loss) High Forward Rate In Dollars        10                  (8)                 (5)
27  Gain (Loss) Low Forward Rate In Dollars    (9)                  7                  5
```

FIGURE 1. This worksheet illustrates the potential effects of the exchange rate of a foreign currency (in this case, the yen) shifting within a predicted range (110 to 160 yen per dollar, cells D6 and D5). Monetary amounts the company owes are handled in rows 12 through 14; monetary amounts the company is owed are handled in rows 18 through 20. Because payable amounts are, to an extent, offset by receivable amounts, the amounts that could be lost by a greatly depressed yen are minimized (rows 26 and 27).

profit will be less. Conversely, if the yen *increases* against the dollar, your profit will be greater.

To reduce risk in your dealings involving foreign currencies, try to strike a balance between receivable amounts and payable amounts in those currencies. That way, if the foreign currency increases against the dollar, the loss on accounts payable will be offset by a gain in accounts receivable. The reverse will hold true if the currency decreases against the dollar. If you can't balance the payable and due amounts, consider buying a forward-exchange contract, which is an agreement to buy or sell a foreign currency at an agreed-upon rate. By buying such an instrument, you can negate much of the risk involved in exposure to exchange-rate changes. We'll look at this in more detail later on.

THE RISK-MANAGEMENT WORKSHEET

Figure 1 shows a worksheet used for evaluating the balance between due and payable amounts over a period of three weeks. Four parameters have been entered in the upper left of the worksheet: the starting date of the period, the starting exchange rate, and estimates of the highest and lowest exchange rates that may occur during the three-week period.

Rows 8 through 14 contain the amounts that the company owes in the foreign currency. Columns B, D, G, and J are formatted for currency with no decimal places. The parentheses indicate negative amounts. The numbers are preceded with a yen symbol instead of a dollar sign because the global setting for currency has been changed; you'll see how to do that later. Because the orders for sportswear have different due dates (column C), the total amount owed is less after two weeks (column G) and less still after three weeks (column J). The amounts in columns headed *Lo* and *Hi* are the dollar amounts gained or lost by the end of each week if the yen hits its predicted highest or lowest point.

Rows 16 through 20 contain a similar section for amounts the company is owed in yen. Row 22 contains formulas that sum the values from both sections, returning receivable amounts or, if the values are in parentheses, payable amounts. Row 26 returns the amounts that will be gained or lost if the yen reaches its predicted high point. Row 27 returns the amount gained or lost if the yen reaches its predicted low point. Here, the most that can be lost is $9 because the payable amounts are mostly offset by the receivable amounts.

If you use *1-2-3* Release 2/2.01 or *Symphony*, set the global currency symbol to ¥ before creating the model. (If you use Release 1A, skip to "Building the Model.") Press slash and select Worksheet Global Default (in *Symphony* press SERVICES and select Configuration), then select Other International Currency, press Escape, press COMPOSE (on most systems, hold down the Alt key and press F1), type *Y=*, press Return, select Prefix, and select Quit Quit. Note that when you pressed Y, nothing happened, but when you pressed the equal sign, the symbol ¥ appeared next to the *Currency sign* prompt. Y= is the compose sequence for the yen symbol. You can create three other special-character currency symbols by pressing COMPOSE and typing a compose sequence: the British pound (L=), the Spanish peseta (pt), and the Dutch guilder (ff). Many other currencies are symbolized by one, two, or three standard characters; for these, you don't need to press the COMPOSE key. If you need to express monetary amounts in deutsche marks, for example, issue the commands to change the currency symbol and enter *DM*. Here are some other common currency symbols that use standard characters:

Country	**Unit**	**Symbol**
Greece	Drachma	Dr
Portugal	Escudo	Esc (or $)
France	Franc	Fr (or F)
Sweden	Krona	Skr (or Kr)
U.S.S.R.	Ruble	R (or Rub)
India	Rupee	Rs
South Korea	Won	W
(Mainland) China	Yuan	Y

Note that if you use more than one character as a currency symbol, you may need to widen the columns containing monetary amounts. Also, the revised currency configuration remains in effect until you either change it or terminate your *1-2-3* or *Symphony* session. If most or all of what you do with your software involves a specific currency, you may wish to change the currency symbol and then save that configuration.

BUILDING THE MODEL

Start with a new worksheet and set the format so that values are displayed with commas and no decimal places: Press slash, then select Worksheet Global Format , and enter 0. (In *Symphony* press MENU, select Settings Format Punctuated, enter 0, and select Quit.) Set the width of column A to 16: With the cell pointer in column A, select /Worksheet Column Set-Width (in *Symphony*, MENU Width Set), and enter *16*. Use the same procedure to set the widths of columns E, F, H, I, K, and L to 5.

Enter all the labels shown in column A of figure 1. Position the cell pointer on cell D3 and enter the formula @DATE(88,1,1). Then select /Range Format Date 2 (in *Symphony*, MENU Format Date 2) and press Return. Enter the values 130, 160, and 110 in cells D4, D5, and D6, respectively. (These hypothetical values refer to the number of foreign currency units the dollar will be converted to. In practice, you can obtain the starting rate from *The Wall Street Journal* or other financial publications and get estimates of future rates from a financial consultant specializing in foreign currencies.) Enter a backslash and hyphen (\-) in cells A11 and B11, then enter the following labels:

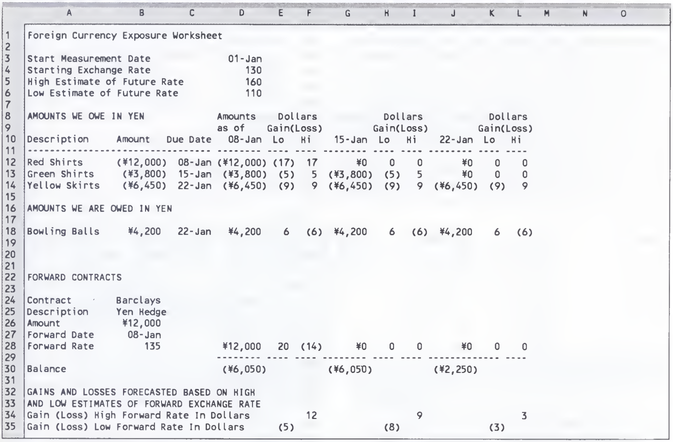
Cell	**Entry**
B10	Amount
C10	Due Date
C11	-------- (eight hyphens)
D8	Amounts
D9	as of
D11	-------- (eight hyphens)
E8	Dollars
E9	Gain(Loss)
E10	Lo
E11	---- (four hyphens)
F10	Hi
F11	---- (four hyphens)

Right-align the labels you've just entered: Select /Range Label Right (in *Symphony*, MENU Range Label-Alignment Right) and specify range B8..F10. Copy range D11..F11 to cell D21. Unless you are using *1-2-3* Release 1A, assign a currency format with no decimal places to ranges B12..B20 and D12..D22. Assign the Date 2 format to range C12..C20. Now enter these values and formulas:

Cell	**Entry**
B12	-12000
B13	-3800
B14	-6450
B18	4200
B19	5900
B20	5400
C12	@DATE(88,1,8)
C13	@DATE(88,1,15)
C14	@DATE(88,1,22)
C18	@DATE(88,1,22)
C19	@DATE(88,1,22)
C20	@DATE(88,1,15)
D12	@IF(D$10>$C12,0,$B12)
E12	+D12/$D$6-D12/$D$4
F12	+D12/$D$5-D12/$D$4
D22	@SUM(D11..D21)
E27	@SUM(E11..E21)
F26	@SUM(F11..F21)

Copy range D12..F12 to range D13..D14, range D12..F14 to cell D18, range D8..F27 to cell G8, and the same range to cell J8. Enter the formula +D3+7 in cell D10. Enter the formula +D10+7 in cell G10 and copy cell G10 to cell J10. Assign the Date 2 format to cells D10, G10, and J10. Your worksheet should now resemble figure 1.

In this example, the possible gains and losses stemming from exchange-rate fluctuations are immaterial compared with the total amount of money changing hands. This is because you offset collection losses against disbursement gains and disbursement losses against collection gains. Even though you have material positions on both the asset and liability sides in a particular foreign currency, these positions largely



```
          A            B        C        D       E    F      G      H    I     J      K    L    M      N      O
1  Foreign Currency Exposure Worksheet
2
3  Start Measurement Date               01-Jan
4  Starting Exchange Rate                  130
5  High Estimate of Future Rate            160
6  Low Estimate of Future Rate             110
7
8  AMOUNTS WE OWE IN YEN             Amounts    Dollars            Dollars            Dollars
9                                    as of    Gain(Loss)         Gain(Loss)         Gain(Loss)
10 Description     Amount   Due Date    08-Jan Lo   Hi     15-Jan Lo   Hi     22-Jan Lo   Hi
11 --------------------------------- -------- ---- ---- -------- ---- ---- -------- ---- ----
12 Red Shirts      (¥12,000)  08-Jan (¥12,000) (17)   17       ¥0    0    0       ¥0    0    0
13 Green Shirts     (¥3,800)  15-Jan  (¥3,800)  (5)    5 (¥3,800)  (5)    5       ¥0    0    0
14 Yellow Skirts    (¥6,450)  22-Jan  (¥6,450)  (9)    9 (¥6,450)  (9)    9 (¥6,450)  (9)    9
15
16 AMOUNTS WE ARE OWED IN YEN
17
18 Bowling Balls      ¥4,200  22-Jan    ¥4,200    6  (6)   ¥4,200    6  (6)   ¥4,200    6  (6)
19
20
21
22 FORWARD CONTRACTS
23
24 Contract        Barclays
25 Description     Yen Hedge
26 Amount            ¥12,000
27 Forward Date       08-Jan
28 Forward Rate          135           ¥12,000   20 (14)       ¥0    0    0       ¥0    0    0
29                                   -------- ---- ---- -------- ---- ---- ------------ ----
30 Balance                            (¥6,050)            (¥6,050)            (¥2,250)
31
32 GAINS AND LOSSES FORECASTED BASED ON HIGH
33 AND LOW ESTIMATES OF FORWARD EXCHANGE RATE
34 Gain (Loss) High Forward Rate In Dollars           12                  9                  3
35 Gain (Loss) Low Forward Rate In Dollars      (5)                (8)                (3)
```

FIGURE 2. Since the company was not able to offset purchases with sales, it elected to purchase a contract to sell ¥12,000 at a rate of 135 yen to the dollar on January 8. This exactly offsets, or hedges, the ¥12,000 payable on January 8 for red shirts (row 12). If the company does not purchase a yen hedge, it can potentially lose up to $25; by buying this instrument, it limits its risk to $5.

offset each other because the settlement dates are similar.

Before going on, save the worksheet you've just created.

FORWARD-EXCHANGE CONTRACTS

In practice, you may be unable to achieve a balance between payables and receivables. One reason might be that the country in which you're conducting business has restrictive trade regulations. Consider once more the scenario of buying sportswear and selling sporting goods in Japan. Suppose that, due to Japanese trade regulations, you do not sell your golf sets. To show the effect of such a situation, erase range A19..L20. The highest amount you will lose if the yen reaches its lowest predicted exchange rate increases from $9 to $25. If this amount of risk is unacceptable, you must explore another avenue for balancing payable amounts against receivable amounts.

Such an avenue exists in a financial instrument called a forward-exchange contract, which is an agreement to buy or sell a foreign currency for a specified future date of delivery at a specified price, or forward rate. If you bear high levels of foreign-currency exposure, you may already use forward-exchange contracts. If you need to learn more about these risk-management tools, consult a bank that's involved in international banking.

The details of forward-exchange contracts are beyond the scope of this article, but the mechanics of including a forward-exchange contract in your worksheet model are simple. In a nutshell, here's how it fits into the process described in this article: A contract to sell a foreign currency for some future date of delivery at a preset rate acts like a payable denominated in a foreign currency. (Conversely, a contract to buy a foreign currency acts like a receivable, payable in that currency.) Accordingly, gains (or losses) on a contract to *sell* will roughly offset losses (or gains) on amounts you are owed in that currency. Gains (losses) on a contract to *buy* offset losses (gains) on amounts you owe.

To modify the worksheet to show the effect of a forward-exchange contract on your foreign-currency risk, first add eight new rows: Position the cell pointer anywhere on row 21, select /Worksheet Insert Row (in *Symphony*, MENU Insert Rows) and press the DownArrow key seven times. Referring to figure 2, enter the labels shown in column A in rows 22 through 28. Assign a currency format with no decimal places to cells B26 and D28 (unless you're using *1-2-3* Release 1A). Next assign the Date 2 format to cell B27. Then enter the following labels, numbers, and formulas:

Cell	**Entry**
B24	Barclays
B25	Yen Hedge
B26	12000
B27	@DATE(88,1,8)
B28	135
D28	@IF(D$10>$B27,0,$B26)
E28	+D28/$D$6−D28/$B28
F28	+D28/$D$5−D28/$B28

Copy range D28..F28 to cell G28, then copy the same range to cell J28.

The worksheet now describes a situation where you have elected to exactly offset, or hedge, the ¥12,000 you're owed for red shirts (cell B12). To do this, you contact Barclays Bank and arrange to purchase a contract to sell 12,000 yen on January 8 (the date that payment is due for the red shirts) at an exchange rate of 135 yen per dollar, regardless of the value of yen on that date. (You'd indicate a contract to *buy* yen by entering a negative value in cell B26.) The forward rate is quoted by Barclays and is based on the present status of the currency market. The highest amount you can lose, if the yen reaches its predicted low, is now $5.

Save this worksheet under a new file name. You've now created two tools for evaluating your risks when dealing in foreign currencies: one based on the balance between payables and receivables and one that factors in the effect of a forward contract. To adapt these spreadsheets for your own use, insert new rows as needed, anywhere between the rows of dashes. Use the keystrokes described earlier to change the global currency symbol, and change any occurrences of the word *yen* to the name of the currency you're dealing with.

Constructing a foreign-currency exposure worksheet allows you to forecast the net positions you will experience in the currencies in which you transact business. Armed with these forecasts, you can estimate possible gains and losses. Then you can plan appropriate risk-management actions. Remember, though, that the worksheet is just a tool for handling the mathematics of exchange-rate shifts. It does nothing to predict these shifts, and it doesn't suggest strategies for dealing with them. Your dealings in foreign currencies must ultimately be guided by discussions with an international banker. As with any financial model, this worksheet can be dangerous to use if you don't understand the assumptions behind it and its limitations. ■

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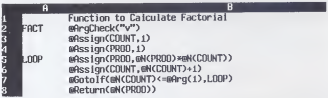

```
       A                    B
1               Function to Calculate Factorial
2  FACT         @ArgCheck("v")
3               @Assign(COUNT,1)
4               @Assign(PROD,1)
5  LOOP         @Assign(PROD,@N(PROD)*@N(COUNT))
6               @Assign(COUNT,@N(COUNT)+1)
7               @GotoIf(@N(COUNT)<=@Arg(1),LOOP)
8               @Return(@N(PROD))
```

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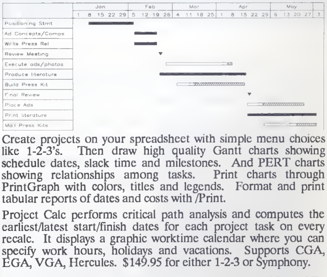

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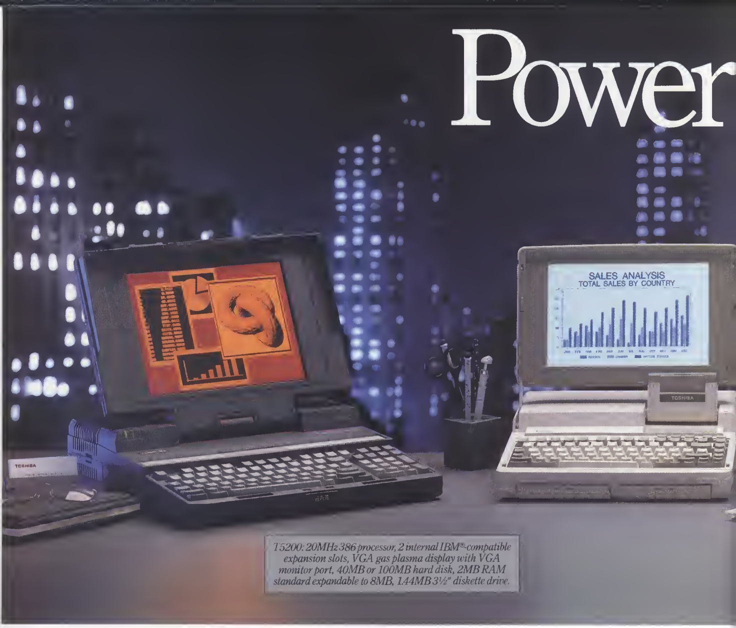

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BARRY ROOT

When Your 1-2-3 Database Goes Haywire

BY PAULA DEMPSEY

Something's wrong with your *1-2-3* database. *1-2-3* extracts all of the records from the Input range, or it doesn't extract any records at all. Whatever the symptoms, trying to fix the problem is time-consuming and frustrating, especially when you thought you had correctly set up each database component. The following procedures will help you pinpoint not-so-obvious problems.

You need to know how a *1-2-3* database works in order to understand what can go wrong when you run a query. Suppose you're the owner of Spielverderber Motors, a luxury-sportscar dealership, and you need a database of the cars you have in stock. Create the database shown in figure 1. This will let you work through the examples in this article.

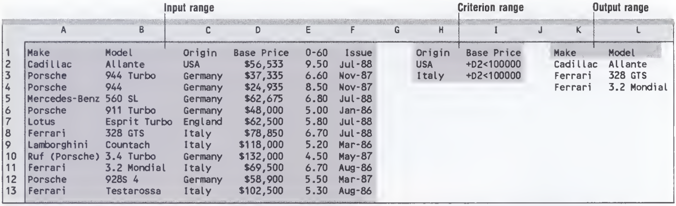
Start with a new worksheet and set the width of column A to 14: With the cell pointer on column A, select /Worksheet Column Set-Width and enter *14*. In the same manner, set the width of columns B, K, and L to 14, the width of columns D and H to 10, the width of column I to 11, and the width of column J to 5. Enter the labels shown in range A1..C13 and in cell D1. Enter *"0-60* in cell E1, and enter *"Issue* in cell F1. Assign a currency format with no decimal places to range D2..D13: Select /Range Format Currency, enter 0, and specify range D2..D13. Enter the values shown in column D. Assign the Fixed format with two decimal places to range E2..E13, and enter the values shown in column E. Assign the Date 3 format to range F2..F13. Then enter the formula @DATE(88,7,1) in cell F2. Enter the rest of the dates shown in column F as @DATE(*year,month*,1).

Use this troubleshooting guide to track down and fix a problem.

A DATABASE REFRESHER COURSE

In this worksheet, range A1..F13 is the Input range, the database itself. The rows contain information about the cars. Each row of information is a record. The columns contain the same type of information for all records: Column A contains the make of the car, column B contains the model, and so on. Each column is a field. The first row of the database contains a unique field name for every column: *Make*, *Model*, and so on. A field name must be a label and must be entered in a single cell.

Now that you've entered



	A	B	C	D	E	F	G	H	I	J	K	L
1	Make	Model	Origin	Base Price	0-60	Issue		Origin	Base Price		Make	Model
2	Cadillac	Allante	USA	$56,533	9.50	Jul-88		USA	+D2<100000		Cadillac	Allante
3	Porsche	944 Turbo	Germany	$37,335	6.60	Nov-87		Italy	+D2<100000		Ferrari	328 GTS
4	Porsche	944	Germany	$24,935	8.50	Nov-87					Ferrari	3.2 Mondial
5	Mercedes-Benz	560 SL	Germany	$62,675	6.80	Jul-88						
6	Porsche	911 Turbo	Germany	$48,000	5.00	Jan-86						
7	Lotus	Esprit Turbo	England	$62,500	5.80	Jul-88						
8	Ferrari	328 GTS	Italy	$78,850	6.70	Jul-88						
9	Lamborghini	Countach	Italy	$118,000	5.20	Mar-86						
10	Ruf (Porsche)	3.4 Turbo	Germany	$132,000	4.50	May-87						
11	Ferrari	3.2 Mondial	Italy	$69,500	6.70	Aug-86						
12	Porsche	928S 4	Germany	$58,900	5.50	Mar-87						
13	Ferrari	Testarossa	Italy	$102,500	5.30	Aug-86						

FIGURE 1. The three components of a *1-2-3* database are the Input range (the database itself), the Criterion range, and the Output range. The Input range must include one row of field names and all the records. The Criterion range must include one or more field names arranged on one row plus one or more rows below them. Here the cells containing criteria are formatted for text—they display formulas rather than results. The Output range may include only one row containing field names, or it may include the field names plus several rows below them. If the Output range includes only one row, as in the example, extracting records will erase any entries in the rows below the field names.

the data, you must tell *1-2-3* where the Input range is located. Select /Data Query Input, specify range A1..F13, and select Quit.

Suppose you want to select cars from the United States or Italy that have a retail value under $100,000. Before doing this, you must set up a Criterion range. A Criterion range consists of one or more field names arranged in one row with criteria listed in subsequent rows. You enter criteria in the same row if you want *1-2-3* to search for records that satisfy all criteria. You enter criteria in separate rows if you want *1-2-3* to search for records that satisfy at least one of the criteria. In figure 1, the Criterion range is H1..I3.

Rather than entering *Origin* and *Base Price* in cells H1 and I1, copy range C1..D1 to cell H1. This is important because field names in the Input and Criterion ranges must match exactly, and copying is the best way to ensure that they do. Assign range H2..I3 the Text format so that cells display formulas instead of the resulting values. Enter what's shown in range H2..I3 of figure 1. Don't use any apostrophes. The criteria shown in figure 1 tell *1-2-3* to search for records where the origin is USA and the price is less than $100,000 or for records where the origin is Italy and the price is less than $100,000. Note that the formulas under the *Base Price* heading in the Criterion range refer to cell D2. When you use this type of formula in a Criterion range, the formula must refer to a cell in the first record in the database under the appropriate field name.

In *1-2-3* Release 2/2.01, you can, alternatively, express these criteria on one row. Use the formula +C2="USA"#OR#C2="Italy" in cell H2 and the formula shown in cell I2.

To specify the Criterion range, select /Data Query Criterion, specify range H1..I3, or H1..I2 for the one-line version, then select Quit.

To see which records match these criteria, select /Data Query Find. *1-2-3* highlights range A2..F2, the first record that matches the criteria. Press DownArrow and *1-2-3* skips over the next several records and highlights range A8..F8, the second record that matches the criteria. Pushing DownArrow or UpArrow highlights the next or the previous record that satisfies the criteria in the Criterion range. If the last record matching the criteria is highlighted and you press DownArrow, *1-2-3* beeps to let you know you've come to the last matching record. To end this operation, press Return or Escape, then select Quit.

If you want to produce a list of records that match the criteria, you must set up and define an Output range. An Output range can consist of one or more field names arranged on one row. In the figure 1 example, we want to list only the *Make* and *Model* fields, so we've included only these field names in the Output range. Copy range A1..B1 to cell K1. Then select /Data Query Output, specify range K1..L1, and select Extract Quit. The makes and models of the American and Italian cars priced under $100,000 appear in range K2..L4. When *1-2-3* copies records to a one-row Output range, it uses as many rows below the field names as necessary. It also erases any cell entries in those columns, from just below the Output-range row to the bottom of the worksheet. Use care when specifying one-row Output ranges.

To prevent *1-2-3* from erasing data, set up an Output range with a specific number of rows. If you have no more than 10 matching records, you can specify K1..L11 as the Output range. When you extract records, *1-2-3* copies the records into this range without erasing any cells below it. If you have more than 10 matching records, *1-2-3* will beep and display the message *Too many records for Output range*. When you press Return, *1-2-3* clears the error message and copies as many records as the Output range can accommodate.

There are two other Data Query commands. Data Query Delete causes *1-2-3* to delete all records from the Input range that match the criteria in the Criterion range, contracting the Input range as it does so. Data Query Unique works like Extract, except that it never creates identical records in the Output range.

> A blank row in a criterion range causes *1-2-3* to select all records.

Problems with *1-2-3* databases fall into one of three categories:

- *1-2-3* selects all records in the Input range, even though you set up criteria to find only specific records.
- *1-2-3* does not select any records.
- *1-2-3* selects some but not all of the records you wanted and perhaps some you didn't want.

The following sections describe possible causes for each problem. Find the section that describes your problem, then check your database to see if any of the listed reasons apply.

1-2-3 SELECTS ALL RECORDS

If *1-2-3* selects all records in the Input range when you run the query, check for these conditions:

Do the field names in the Input and Criterion ranges match exactly? If the field names look like exact matches, check whether a trailing space follows a field name in either the Input or Criterion range. To check a label for a trailing space, position the cell pointer on that label and press EDIT. Look at the cell contents on the edit line, and check whether the blinking cursor immediately follows the last letter. If you find a space between the last letter and the cursor, press the Backspace key to delete the space, then press Return.

Again, copying field names from the Input range to the Criterion range is the best way to ensure that the field-name labels match each other exactly.

Does the Criterion range contain any blank rows? A blank row causes *1-2-3* to select all records. Blank rows can result when you erase entries without changing the size of the Criterion range. Look again at the Criterion range in figure 1. Suppose you want *1-2-3* to select only American cars under $100,000. Erasing range H3..I3 is not sufficient. You must also select /Data Query Criterion, press UpArrow to contract the existing Criterion range by one row, then press Return and select Quit.

Be careful about using the Worksheet Delete Row command to erase a row of criteria. You might accidentally delete a record in the Input range or other worksheet data.

Do all formulas in the Criterion range contain references to the first cell under the corresponding field name? Whenever you use a formula in a Criterion range, you must include a reference to the appropriate cell in the first record of the Input range. For instance, suppose you want to list all cars issued in July 1988. Since all dates in the *Issue* field are entered as the first day of the month, using @DATE(*year,month*,1), you want to search for records with an issue date of July 1, 1988. Create a new Criterion range: Copy cell F1 to cell H5, then select /Data Query Criterion, specify range H5..H6, and select Quit. Assign the Text format to cell H6. If you enter @DATE(88,7,1) in cell H6 and select /Data Query Extract, *1-2-3* will copy all the makes and models from all the records to the Output range. Instead, you must enter the formula +F2=@DATE(88,7,1) in cell H6. This will work because it contains a reference to the first cell in the *Issue* field.

You could also avoid this problem by converting a formula to a value. Try this: With the cell pointer on cell H6, enter the formula @DATE(88,7,1), press the CALC key, then press Return. This puts 32325, the serial value of July 1, 1988, in the cell. This criterion will cause only the desired records to be extracted.

Does the Criterion range contain an invalid field name? *1-2-3* does not consider numeric values or the result of formulas to be valid field names. If the Criterion range contains an invalid field name, *1-2-3* ignores that field's criterion. Use labels, not string-returning formulas, as field names. For example, suppose that instead of entering *Make* in a Criterion range, you enter *+A1* so that the cell displays the word *Make*. Although the field name appears in the cell, you've created an invalid Criterion range.

Is the row of field names included in the Input range? Check the dimensions of the Input range by selecting /Data Query Input. The highlighted Input range should include the field names. If not, adjust the Input range.

Are you using the wild-card character (asterisk) correctly? An asterisk represents any number of characters (including spaces) in a label, but it can be placed only at the end of the label. The record on row 10 is for a Porsche, even though the label in cell A10 does not begin with *Porsche*. You can't search the database by entering the label **Porsche**. *1-2-3* ignores any labels in a Criterion range that begin with an asterisk.

In Release 2/2.01 to search for labels in the *Make* field that contain the word *Porsche*, copy cell A1 to cell H5, select /Data Query Criterion, specify range H5..H6, and select Quit. Then enter this formula in cell H6:

@FIND("Porsche",A2,0)+1

Note that the @FIND function is case-sensitive. The string the formula is searching for, in this case "Porsche", must be capitalized if the string is capitalized in the Input range.

1-2-3 SELECTS NO RECORDS

If *1-2-3* does not select any records when you run a query, check for the following conditions, but don't overlook the possibility that there really aren't any records in the database that match the criteria.

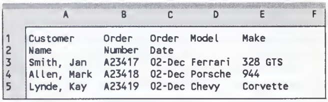
Do all of your criteria exactly match the corresponding database entries? If you use *1-2-3* Release 1A, labels in the Criterion range must match the entries you're looking for in the Input range, including the placement of uppercase and lowercase letters. With Release 2/2.01, uppercase and lowercase letters in labels (but not in string-returning formulas) are treated equally.

No release, however, ignores trailing spaces at the end of the entry or the criterion. For example, suppose you typed the label *Ferrari* in a Criterion range, but before pressing Return you accidentally hit the Spacebar without noticing. When you perform a query, *1-2-3* searches the *Make* field for the label *Ferrari* followed by a space. Assuming it doesn't find such a label, *1-2-3* will produce an empty Output range.

Does a cell in the Criterion range only appear to be blank? Some people are in the habit of erasing a cell by positioning the pointer on it, typing a space, and pressing Return. This is a bad idea in general. When you empty a cell in a Criterion range this way, *1-2-3* looks in the Input range for labels consisting of a single space. You should erase a cell by selecting /Range Erase and specifying the cell address.

A cell that contains only a label prefix or that's assigned the Hidden format also appears to be empty when it isn't. To check a cell for invisible entries, position the cell pointer on the cell and look at the control panel above the top border of the spreadsheet.

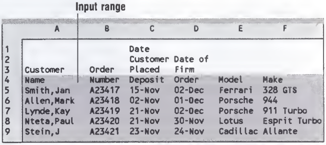
Are all field names entered on one row? If you set up a database using two rows for field names, *1-2-3* might not select any records. Such a database would look like this:



	A	B	C	D	E
1	Customer	Order	Order	Model	Make
2	Name	Number	Date		
3	Smith, Jan	A23417	02-Dec	Ferrari	328 GTS
4	Allen, Mark	A23418	02-Dec	Porsche	944
5	Lynde, Kay	A23419	02-Dec	Chevy	Corvette

If you specify range A1..E5 as the Input range, *1-2-3* considers row 2 as the first record, not as part of the field names. This means that the first row contains a duplicate field name: the word *Order* in cells B1 and C1. If you queried this database, *1-2-3* would ignore one of those fields.

If you want to provide more descriptive field headings by using more than one row, make sure that each label in the row above the first record is unique. When you define the Input range, include only the last row of the column headings. Figure 2 shows such a database, where row 4 contains the field names.



	A	B	C	D	E	F
1			Date			
2			Customer	Date of		
3	Customer	Order	Placed	Firm		
4	Name	Number	Deposit	Order	Model	Make
5	Smith,Jan	A23417	15-Nov	02-Dec	Ferrari	328 GTS
6	Allen,Mark	A23418	02-Nov	01-Dec	Porsche	944
7	Lynde,Kay	A23419	21-Nov	02-Dec	Porsche	911 Turbo
8	Nteta,Paul	A23420	21-Nov	30-Nov	Lotus	Esprit Turbo
9	Stein,J	A23421	23-Nov	24-Nov	Cadillac	Allante

FIGURE 2. If you use several rows to create descriptive column headings, make sure that every entry in the bottommost row of the headings is unique, and include only the last row of the column headings when you specify the Input range.

Are all three database ranges specified correctly? Check the dimensions of the Input, Criterion, and Output ranges. Make sure the ranges include the row of field names.

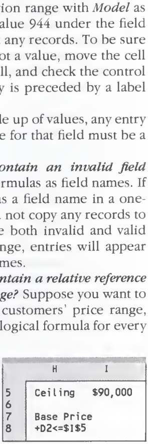
Does the Criterion or Output range have too many fields? An Input range can include up to 256 fields, as many as there are columns in the worksheet. However, the Criterion and Output ranges will work correctly only with 32 or fewer fields. If you exceed this number, you may be able to run a query, but the results may be inaccurate or *1-2-3* may not select any records.

Have you entered a criterion as a value when it should be a number? In figure 1, all the entries in the *Model* column are labels, including the label *944* in cell B4. If you set up a Criterion range with *Model* as its only field and enter the value 944 under the field heading, *1-2-3* will not select any records. To be sure that an entry is a label and not a value, move the cell pointer to the appropriate cell, and check the control panel to make sure the entry is preceded by a label prefix.

Conversely, if a field is made up of values, any entry you make in a Criterion range for that field must be a value, not a label.

Does the Output range contain an invalid field name? Don't use values or formulas as field names. If you use a value or formula as a field name in a one-field Output range, *1-2-3* will not copy any records to the Output range. If you use both invalid and valid field names in an Output range, entries will appear only under the valid field names.

Does the Criterion range contain a relative reference to a cell outside the Input range? Suppose you want to search for cars within your customers' price range, but you don't want to enter a logical formula for every new customer. Assign a currency format with no decimal places to cell I5 and the Text format to cell H8, then enter the following labels, value, and formula in your worksheet:



	H	I
5	Ceiling	$90,000
6		
7	Base Price	
8	+D2<=$I$5	

1-2-3 does not consider numeric values or formulas to be valid field names.

Select /Data Query Criterion, specify range H7..H8, and select Extract Quit. *1-2-3* will extract records in which the price of the car does not exceed the value you enter in cell I5. For this to work, cell H8's formula must be an absolute reference to cell I5. If it isn't, *1-2-3* will use only the amount in cell I5 when it tests the first record. When it tests the second record, it will use the entry in cell I6, which in this case is blank. When it tests the third record, it will compare it with the entry in cell I7, and so on. In some cases, this problem causes *1-2-3* to select all records. Note, however, that the reference to cell D2 must be relative.

1-2-3 SELECTS SOME BUT NOT ALL RECORDS

When *1-2-3* selects some but not all records, it is usually because the Criterion range contains multiple criteria, one of which doesn't work. If you suspect this is the cause of your problem, find any erroneous criteria by testing each criterion separately.

Do entries that are supposed to match really match? Look at column A in figure 1, and you'll see three Ferrari entries. If you perform a query using the label *Ferrari* in the Criterion range and *1-2-3* selects only two records, one of the labels may contain a trailing space. Furthermore, if the database were much larger, it would be hard to spot a misspelling, such as *Ferrari*.

Here's a good way to check for misspellings among the entries in the *Make* field: Specify a Criterion range with no entries below the field names; it doesn't matter which fields you use. Then create an Output range that contains only the *Make* field: Select /Data Query Output, and press LeftArrow to contract the Output range to include only cell K1. Then select Unique Quit. The Output range will contain the set of every unique entry in the Input range's *Make* field. It should now be easy to spot any problems. If two entries are apparently spelled alike, one of them probably has a trailing space. Find and correct any offending entries, then repeat the Unique operation to make sure you've found them all.

Are the dimensions of the database ranges correct? First, check the Input range's dimensions by selecting /Data Query Input. Make sure the highlighted area includes all fields and records. Next, select Criterion to check the dimensions of the Criterion range. Make sure that all rows of criteria are included.

Do any Criterion-range formulas include cell references that contain field names? Formulas or functions that serve as criteria must contain a cell reference to the corresponding field in the Input range's first record, not to the field name. For example, suppose you want to create a list of all cars that can accelerate to 60 miles per hour in under six seconds. Make sure that the Criterion range is H7..H8, copy cell E1 to cell H7, then enter the formula +E2<6 in cell H8. If you used the formula +E1<6, *1-2-3* would not select the correct records.

Is there a row of empty cells or a dashed line between the field names and the first record? Setting up an Input range with an empty row or a row of dashes between the field names and the records may improve the appearance of the worksheet, but it can cause problems, especially if you use formulas in the Criterion range. Put your first record in the row immediately below the field names.

Are there Input-range entries that should be formulas but are entered as labels? If someone inadvertently enters the label "*$132,000* in cell D10 of figure 1 and you create a Criterion range to select cars priced at over $100,000, *1-2-3* will not select the record for the Ruf 3.4 Turbo. In the example, all column D entries must be values.

If you use *1-2-3* Release 2/2.01, you can easily check the *Base Price* field for labels. Copy cell D1 to cell H7, and enter the formula @ISSTRING(D2) in cell H8. Then select /Data Query Find. *1-2-3* will highlight any records with a string in the *Base Price* column. If there are no such records, *1-2-3* beeps and returns you to the Query menu.

IF ALL ELSE FAILS

If the troubleshooting tips described don't solve your database problem, try re-creating the Criterion range. First, erase a worksheet area large enough to hold the Criterion range—even if this area appears to be blank. There may be stray label prefixes or entries with hidden formats lurking about. Next, copy the field names from the Input range to the first row of this blank area.

Before you enter any criteria, test your database. Select /Data Query Criterion, and specify the range containing the field names you just copied and the empty row below them. Then perform a query. *1-2-3* should select all records in the Input range, since the Criterion range contains no criteria. If it doesn't, make sure you have correctly set up the Input and Output ranges. If it does select all the records, enter various criteria and repeat the query. If the database still isn't working properly, you've probably incorrectly entered the criterion.

For more information on *1-2-3* databases, see "Creating a *1-2-3* Database" (June 1986) and "A First Encounter with the *1-2-3* Database" (May 1988). ■

Paula Dempsey wrote about managing computer memory in the November issue of LOTUS.

KNOW YOUR BREAK-EVEN POINT

BY KEN SAUL

Do you know your business's break-even point? More important, can you accurately state what levels of production and sales yield the optimum profit? If you answer no to either question, this model, which works in *1-2-3* Release 2/2.01 or *Symphony* Release 1.2/2.0, provides the answers. It uses the Data Regression command, a one-way data table, and a few simple formulas to evaluate and help ensure the profitability of your business.

A business's break-even point occurs when revenue equals cost. When the variables exhibit a linear relationship, the break-even point is easy to find. On a graph, it's the point at which the cost and revenue lines cross.

Figure 1 shows a graph of a linear break-even analysis for the production and sale of a new book. The publisher breaks even—neither makes nor loses money—when it sells a few more than 200 books. If sales rise above this point, the publisher realizes profit. If they fall below, the publisher loses money. Assuming that all the units produced can be sold at a constant price, revenues will increase as sales increase.

Many businesses, however, don't follow this neat pattern. Instead they show a nonlinear relationship between cost and revenue. For example, at some

How to ensure the ongoing profitability of your business

CAROL VIDINGHOFF

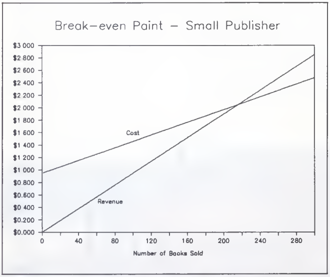


FIGURE 1. A linear break-even analysis shows revenue and cost lines that intersect at the break-even point, which is just beyond the 200-book mark.

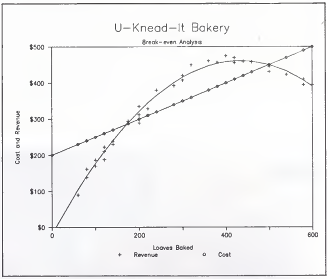


FIGURE 2. A nonlinear break-even analysis shows two break-even points where the curved revenue line crosses the cost line. The break-even point near 200 loaves indicates the minimum number of loaves that the bakery must bake and sell in order not to lose money. The break-even point near 500 loaves indicates the maximum number the bakery can make and sell before spoilage and sales of discounted, day-old bread force the revenue curve below the cost line. The apex of the revenue curve shows the optimum production level.

point in production, cost may decrease because the business receives quantity discounts from its vendors. Or revenue may drop off because the products become spoiled or obsolete. In these cases, one or both lines may be curved.

As an example of nonlinear break-even analysis, consider figure 2, a graph of U-Knead-It Bakery's bread operation. Cost forms a straight line, while revenue follows a curved path. This nonlinear relationship between cost and revenue results in two break-even points where the curved revenue line crosses the cost line. The break-even point near 200 loaves represents the minimum number of loaves that the bakery must make and sell in order not to lose money. The break-even point near 500 loaves represents the maximum number of loaves the bakery can make and sell before spoilage and sales of discounted, day-old bread force the revenue curve below the cost line. The apex of the curved line that runs between these two points represents the number of loaves that U-Knead-It Bakery should bake in order to sell them all at full price and not have to sell day-old loaves.

Let's assume that you run U-Knead-It's bread operation. Follow these steps to determine the bakery's break-even and optimum-operating points.

Step 1: Collect Historical Data and Perform Regression Analysis

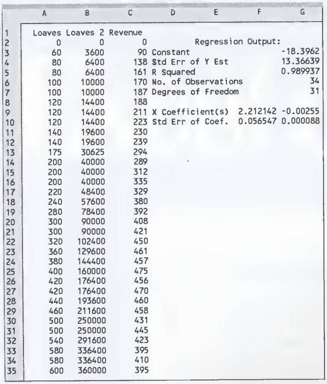
Each day for five weeks, you have collected data on the number of loaves baked and the amount of revenue earned. Columns A and C of figure 3 contain the number of loaves baked and the corresponding revenue, respectively. The data is sorted in ascending order according to the number of loaves.

You need to create a formula to use in a data table (in *Symphony*, what-if table) that will calculate revenue generated at a variety of production levels. To obtain the values for the formula, use the Data Regression command (in *Symphony*, Range Regression command) on the historical production data.

To build the regression model, enter the labels in row 1 and the loaf and revenue data in columns A and C, respectively. Center the labels in range A1..B1. Select /Range Label Center (in *Symphony*, MENU Range Label-Alignment Center) and specify range A1..B1. Enter the formula +A2^2 in cell B2, and copy that cell to range B3..B35. This formula squares the values in column A. If you're using *1-2-3*, select /Data Regression X-Range, and specify range A2..B35. Select Y-Range and specify C2..C35. Select Output-Range and specify cell D2. Then select Go. The Data Regression command automatically generates the output shown in range D2..G10 of figure 3.

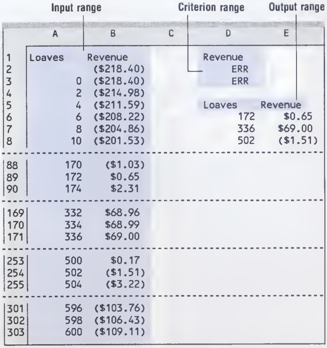
If you're using *Symphony*, attach the Statistical Analysis add-in. (If you're using a two-disk-drive system, first insert the Help and Tutorial disk in drive A.) Press SERVICES and select Application Attach, specify STAT.APP, and then select Quit. Next press MENU, select Range Regres X-Range, and specify range A2..B35. Select Y-Range and specify range C2..C35. Select Output-Range and specify cell D2. Then select Go.

The type of analysis you just performed is called curvilinear regression. Curvilinear regression differs from linear regression in that the dependent variable Y is related not to just one X variable, but to a series of X variables that are the independent variable X raised to various powers. Here we've squared X and



```
        A        B         C        D         E          F         G
1   Loaves Loaves 2 Revenue
2        0        0        0           Regression Output:
3       60     3600       90 Constant                        -18.3962
4       80     6400      138 Std Err of Y Est                13.36639
5       80     6400      161 R Squared                       0.989937
6      100    10000      170 No. of Observations                   34
7      100    10000      187 Degrees of Freedom                    31
8      120    14400      188
9      120    14400      211 X Coefficient(s)  2.212142 -0.00255
10     120    14400      223 Std Err of Coef.  0.056547 0.000088
11     140    19600      230
12     140    19600      239
13     175    30625      294
14     200    40000      289
15     200    40000      312
16     200    40000      335
17     220    48400      329
18     240    57600      380
19     280    78400      392
20     300    90000      408
21     300    90000      421
22     320   102400      450
23     360   129600      461
24     380   144400      457
25     400   160000      475
26     420   176400      456
27     420   176400      470
28     440   193600      460
29     460   211600      458
30     500   250000      431
31     500   250000      445
32     540   291600      423
33     580   336400      395
34     580   336400      410
35     600   360000      395
```

FIGURE 3. Use curvilinear regression analysis on historical data to generate variables for constructing a profit formula.



```
         A           B          C          D           E
1    Loaves      Revenue                Revenue
2               ($218.40)                   ERR
3            0  ($218.40)                   ERR
4            2  ($214.98)
5            4  ($211.59)               Loaves      Revenue
6            6  ($208.22)                  172        $0.65
7            8  ($204.86)                  336       $69.00
8           10  ($201.53)                  502      ($1.51)
-----------------------------------------------------------
88         170    ($1.03)
89         172     $0.65
90         174     $2.31
-----------------------------------------------------------
169        332    $68.96
170        334    $68.99
171        336    $69.00
-----------------------------------------------------------
253        500     $0.17
254        502    ($1.51)
255        504    ($3.22)
-----------------------------------------------------------
301        596  ($103.76)
302        598  ($106.43)
303        600  ($109.11)
```

FIGURE 4. By substituting into the profit formula a series of values for the variable *loaves*, you determine revenue earned at various production levels. The Data Query Extract (in *Symphony*, Query Extract) command pulls the break-even and optimum production points out of the analysis and displays them in range D6..E8.

included both the X and X^2 terms in the analysis. Curvilinear regression does not assume that your variables—in this case, loaves produced (the X variables) and revenue (the Y variable)—display a linear relationship. Therefore, you can use this regression technique for all data, whether or not the data shows a linear relationship between the variables.

For further background on regression, see "Curvilinear Regression in Release 2" (May, 1987) and "Linear Regression—The Easy Way" (June, 1986).

Step 2: Develop a Profit Formula

Using values from the regression output, develop a profit formula that subtracts cost from revenue. You'll enter the actual formula into the worksheet when you get to Step 3. First devise the revenue portion of the formula. To solve for revenue, which is the dependent variable, multiply X by the X coefficient and then add the constant. You have two X coefficients (cells F9 and G9) and a constant (cell G3). Your formula will look like this:

$$2.212142*loaves - 0.00255*loaves^2 - 18.3962$$

The cost portion of the formula is simpler. The bakery has a daily fixed cost of $200, which covers rent, salary, depreciation, and insurance. In addition, there is a total variable cost of 50 cents per loaf for ingredients. Thus, the formula for cost is:

$$200 + 0.50*loaves$$

To construct the entire profit formula, subtract the cost formula from the revenue formula:

$$(2.212142*loaves - 0.00255*loaves^2 - 18.3962) - (200 + 0.50*loaves)$$

Step 3: Run the Data Table

To determine profits at various levels of bread production, use a one-way data table (in *Symphony*, what-if table) that substitutes into the profit formula a series of values for the variable *loaves*. The points where revenue minus cost equals zero are the break-even points, while the point representing the optimum-operating point is where revenue minus cost is greatest.

Set up the data table in a new worksheet. Begin by setting the global column width to 10. Select /Worksheet Global Column-Width and enter *10*. (In *Symphony*, select MENU Settings Width, enter *10,* and select Quit.) Format range B2..B303 for currency with two decimal places. Select /Range Format Currency (in *Symphony*, MENU Format Currency), press Return to accept two decimal places, and specify range B2..B303. Then enter the labels shown in range A1..B1 of figure 4. Using the Data Fill command (in *Symphony*, Range Fill), enter the series of values that you want to be substituted into the profit formula. Select /Data Fill (in *Symphony*, MENU Range Fill), and specify a Fill range that is large enough to contain all of the values—in this case, range A3..A303. Specify a start

Tracking the break-even and optimum-operating points is an ongoing process.

value of 0, a step value of 2, and press Return to accept the default stop value. The range fills with numbers that increase incrementally by 2 from 0 to 600.

When you use the Data Fill command, be aware of two requirements. First, leave cell A2 blank, since the data table requires this. Second, specify a Fill range that is large enough to ensure that you'll cover the highest value in the historical data.

Enter the profit formula in cell B2:

```
(2.212142*C1 - 0.00255*C1^2 - 18.3962) -
  (200 + 0.50*C1)
```

Notice that you substituted the cell address C1 for the variable *loaves*. This blank cell, C1, is the Input cell for the data table. Each time the data table calculates the formula in cell B2, the Input cell contains a different value from range A3..A303. Also note that the figure shows data in columns D and E. You'll learn about those in a moment.

If you use *1-2-3*, calculate the data table by selecting /Data Table 1. (If you use *Symphony*, select MENU Range What-I 1-Way.) Enter the Table range A2..B303. Specify cell C1 as the Input cell. Column B displays a series of values that represent revenue generated at the production levels shown in column A. For example, if you produce only four loaves, you generate −$211.59 in revenue.

Step 4: Extract the Break-even and Optimum-Operating Points

The break-even and optimum-operating points are in column B. Although you could scan the list to find them, use the Data Query Extract (in *Symphony*, Query Extract) command to pull these points out of the listing.

Copy cell B1 to cell D1. Then copy range A1..B1 to cell D5. Now specify criterion formulas that evaluate each entry in column B to determine whether or not it is a break-even or an optimum-operating point. The following two criterion formulas do the trick. Enter them in the cells indicated:

Cell	**Formula**
D2	(B1<0#AND#B2>0)#OR#(B1>0 #AND#B2<0)
D3	+B2>B3#AND#B2>B1

Both formulas initially return 0 in *1-2-3* Release 2.01 and ERR in *1-2-3* Release 2.0 and *Symphony*. The first formula tests for break-even points by looking for changes from negative to positive, and vice versa. A break-even point occurs at those sign changes. The second formula tests for the optimum-operating point, which is the highest profit figure in column B. The formula evaluates whether the current cell is greater than both the previous cell and the next cell.

If you use *1-2-3*, extract the values for the break-even and optimum-operating points by selecting /Data Query Input. Specify range A1..B303. Select Criterion and specify range D1..D3. Select Output and specify D5..E5. Finally select Extract Quit. If you use *Symphony*, select MENU Query Settings Basic Database and specify range A1..B303. Select Criterion and specify range D1..D3. Select Output and specify range D5..E5. Select Quit Quit Extract Quit.

Three pairs of values appear in the Output range. The first and third pairs represent the break-even points, while the second is the optimum-operating point. With this information, you know that given the current cost, bread price, and sales volume, U-Knead-It Bakery needs to bake and sell 172 loaves to break even. The optimum number of loaves to bake is 336. At this point U-Knead-It has the best chance of selling all of its bread at full price. If U-Knead-It bakes more than 336 loaves a day, it risks losing some profit because of spoilage and sales of day-old bread.

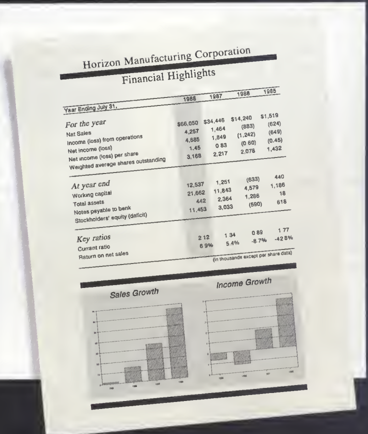
TAKING CARE OF BUSINESS

Tracking the break-even and optimum-operating points should be an ongoing process. Whenever your product, production process, price, or sales volume changes, perform a new break-even analysis. For example, if you cut the cost of ingredients per loaf from 50 cents to 45 cents, substitute 0.45 into the profit formula in cell B2 of figure 4, run the data table, and extract the new break-even and optimum-operating points.

Construct a line graph of your historical break-even points. If break-even points creep upward, your profit may become marginal. This occurs, for example, if cost rises and you don't adjust the selling price accordingly. Regular use of break-even analysis helps to ensure the ongoing profitability of your business. ■

Ken Saul, a process engineer at Hewlett-Packard, wrote about inventory control in the September issue of LOTUS.

Excel or 1-2-3?



Horizon Manufacturing Corporation

Financial Highlights

Year Ending July 31,	1988	1987	1988	1985
For the year				
Net Sales	$66,050	$34,446	$14,240	$1,519
Income (loss) from operations	4,257	1,464	(883)	(624)
Net income (loss)	4,685	1,849	(1,242)	(649)
Net income (loss) per share	1.45	0.83	(0.60)	(0.45)
Weighted average shares outstanding	3,168	2,217	2,078	1,432
At year end				
Working capital	12,537	1,251	(633)	440
Total assets	21,662	11,843	4,579	1,186
Notes payable to bank	442	2,364	1,286	18
Stockholders' equity (deficit)	11,453	3,033	(590)	618
Key ratios				
Current ratio	2.12	1.34	0.89	1.77
Return on net sales	6.9%	5.4%	-8.7%	-42.8%

(In thousands except per share data)

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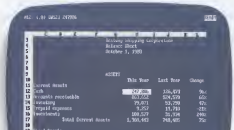

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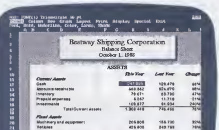

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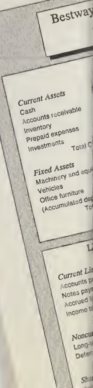

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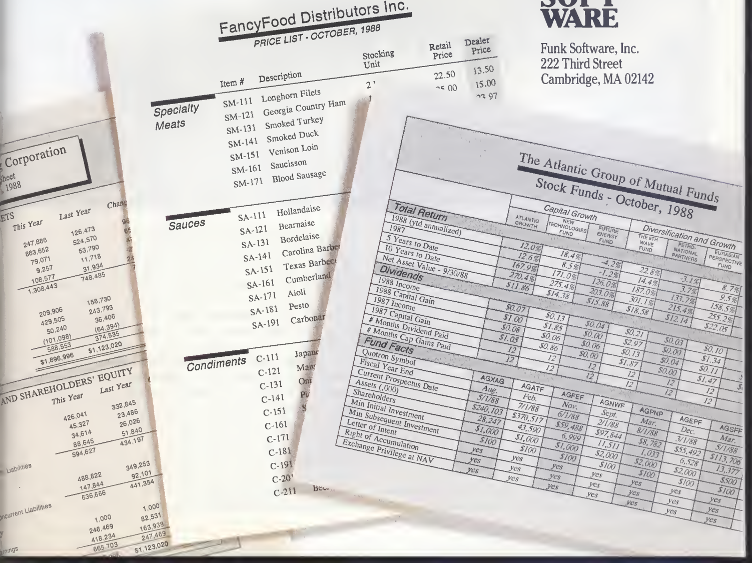


Corporation
Sheet
1988

ETS	This Year	Last Year
	247,886	126,473
	863,652	524,570
	79,071	53,790
	9,257	11,718
	108,577	31,934
	1,308,443	748,485
	209,906	158,730
	429,505	243,793
	50,240	36,406
	(101,098)	(64,394)
	588,553	374,535
	$1,896,996	$1,123,020

AND SHAREHOLDERS' EQUITY	This Year	Last Year
	426,041	332,845
	45,327	23,486
	34,614	26,026
	88,645	51,840
	594,627	434,197
Liabilities	488,822	349,253
	147,844	92,101
	636,666	441,354
oncurrent Liabilities	1,000	1,000
y	246,469	82,531
	418,234	163,938
arnings	665,703	247,469
		$1,123,020

FancyFood Distributors Inc.
PRICE LIST - OCTOBER, 1988

	Item #	Description	Stocking Unit	Retail Price	Dealer Price
Specialty Meats	SM-111	Longhorn Filets		22.50	13.50
	SM-121	Georgia Country Ham			15.00
	SM-131	Smoked Turkey			
	SM-141	Smoked Duck			
	SM-151	Venison Loin			
	SM-161	Saucisson			
	SM-171	Blood Sausage			
Sauces	SA-111	Hollandaise			
	SA-121	Bearnaise			
	SA-131	Bordelaise			
	SA-141	Carolina Barbe			
	SA-151	Texas Barbec			
	SA-161	Cumberland			
	SA-171	Aioli			
	SA-181	Pesto			
	SA-191	Carbonar			
Condiments	C-111	Japan			
	C-121	Man			
	C-131	On			
	C-141	P			
	C-151	S			
	C-161				
	C-171				
	C-181				
	C-191				
	C-20				
	C-211	Bec			

The Atlantic Group of Mutual Funds
Stock Funds - October, 1988

	Capital Growth			Diversification and Growth			
	ATLANTIC GROWTH	NEW TECHNOLOGIES FUND	FUTURE ENERGY FUND	THE 9TH WAVE FUND	PETRO-NATIONAL PARTNERS	EURASIAN PERSPECTIVE FUND	
Total Return							
1988 (ytd annualized)	12.0%	18.4%	-4.2%	22.8%	-3.1%	8.7%	
1987	12.6%	8.5%	-1.2%	14.4%	3.7%	9.5%	
5 Years to Date	167.9%	171.0%	126.0%	187.0%	133.7%	158.5%	
10 Years to Date	270.4%	275.4%	203.0%	301.1%	215.4%	255.2%	
Net Asset Value - 9/30/88	$11.86	$14.38	$15.88	$18.58	$12.14	$22.05	
Dividends							
1988 Income	$0.07	$0.13	$0.04	$0.21	$0.03	$0.10	
1988 Capital Gain	$1.00	$1.85	$0.00	$2.97	$0.00	$1.34	
1987 Income	$0.08	$0.06	$0.06	$0.13	$0.04	$0.11	
1987 Capital Gain	$1.05	$0.86	$0.00	$1.87	$0.00	$1.47	
# Months Dividend Paid	12	12	12	12	12	12	
# Months Cap Gains Paid	12	12	12	12	12	12	
Fund Facts							
Quotron Symbol	AGXAG	AGATF	AGFEF	AGNWF	AGPNP	AGEPF	AGSFF
Fiscal Year End	Aug.	Feb.	Nov.	Sept.	Mar.	Dec.	Mar.
Current Prospectus Date	5/1/88	7/1/88	6/1/88	2/1/88	8/1/88	3/1/88	5/1/88
Assets (,000)	$240,103	$370,517	$59,488	$97,844	$8,782	$55,492	$113,706
Shareholders	28,247	43,590	6,999	11,511	1,033	6,528	13,377
Min Initial Investment	$1,000	$1,000	$1,000	$2,000	$2,000	$2,000	$500
Min Subsequent Investment	$100	$100	$100	$100	$100	$100	$100
Letter of Intent	yes	yes	yes	yes	yes	yes	yes
Right of Accumulation	yes	yes	yes	yes	yes	yes	yes
Exchange Privilege at NAV	yes	yes	yes	yes	yes	yes	yes

IS IT A FLUKE?

BY EVERETTE S. GARDNER JR.

Management decisions are almost always based upon sample data rather than on complete information. In my experience, few managers know just how effectively they can use sample data to compute probabilities and guide decision making.

Here's an example of a problem involving probabilities: You rate your salespeople by computing the percentage of the calls they make that result in a sale. Historical records show that your salespeople are successful in 25% of their calls. One day you hire a new salesperson, Wanda. After Wanda completes training, she makes 100 calls but only 12 sales. Is this a fluke, or does Wanda lack ability? Specifically, what's the probability that Wanda will do no better than 12%, if she really is equal in ability to the rest of the sales force?

I recently posed this problem to a seminar group of 20 middle managers. Fourteen managers were not concerned about Wanda, arguing that she was probably just having a run of bad luck. Only six managers thought Wanda was performing below expectations. The second group was correct. If Wanda is equal in ability to the rest of the sales force, the exact probability of making no more than 12 sales in 100 calls is six hundredths of a percent, less than one chance in a thousand.

That figure is more than a lucky guess. It is the result of using the binomial distribution, a statistical tool that is particularly easy to use in spreadsheet form. (See the box for a full explanation of the principles of probability theory.)

THE BINOMIAL CALCULATOR

There are two ways to determine binomial probabilities: Look them up in a statistics textbook, or compute them. The simple worksheet depicted in the

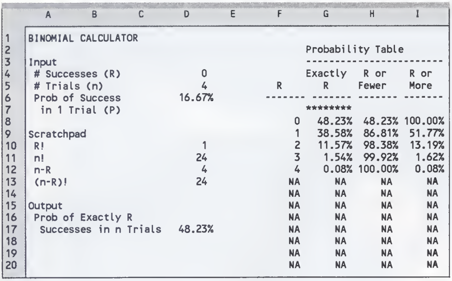
FRANCINE ZASLOW

spreadsheet screen performs the calculations for you. To use the worksheet, you need three pieces of information: R, the number of successes; n, the number of trials; and P, the probability of success on one trial. The formula in cell D17 computes the probability of getting exactly R successes in n trials.

The values in range D4..D6 indicate the probability of not having a six, or any other number you specify, show up in four rolls of a die. You enter the number of successes, 0, in cell D4. You enter the number of trials, in this case 4, in cell D5. You enter the probability of a success in one trial, in this case 1/6, in cell D6. Cell D6 displays the percentage equivalent of that fraction, 16.67%. The formula in cell D17 returns 48.23%. This is the probability of getting no sixes in four rolls.

The Probability Table on the right side of the worksheet lists additional information for the probability

Probability lets you know whether sample data reflects the big picture.



```
      A       B       C       D       E       F       G       H       I

1   BINOMIAL CALCULATOR
2                                                   Probability Table
3   Input                                           -----------------------
4    # Successes (R)              0                 Exactly   R or    R or
5    # Trials (n)                 4             R      R      Fewer   More
6    Prob of Success         16.67%           ------- ------- ------- -------
7     in 1 Trial (P)                                ********
8                                               0  48.23%  48.23% 100.00%
9   Scratchpad                                  1  38.58%  86.81%  51.77%
10   R!                           1             2  11.57%  98.38%  13.19%
11   n!                          24             3   1.54%  99.92%   1.62%
12   n-R                          4             4   0.08% 100.00%   0.08%
13   (n-R)!                      24            NA      NA      NA      NA
14                                             NA      NA      NA      NA
15  Output                                     NA      NA      NA      NA
16   Prob of Exactly R                         NA      NA      NA      NA
17    Successes in n Trials  48.23%            NA      NA      NA      NA
18                                             NA      NA      NA      NA
19                                             NA      NA      NA      NA
20                                             NA      NA      NA      NA
```

The binomial calculator, columns A through D, tells you the probability of repeatedly performing an operation with two outcomes and having one of the outcomes occur a specified number of times in a specified number of trials. The values in range D4..D6 are related to the likelihood of throwing a single die and not having one of its faces, for example a six, show up in four throws. The probability of no successes in four trials with a 1/6 probability of success in one trial is 48.23%, shown in cell D17. The Probability Table, columns F through I, gives you the probability computed in cell D17 and also the probability of *R* or fewer successes and *R* or more successes for different values of *R*.

you entered. Starting in row 8, the table lists the probabilities for different numbers of successes, ranging from zero to the number of trials. Column G lists the probabilities for exactly *R* successes, column H lists the probabilities for *R* or fewer successes, and column I lists the probabilities for *R* or more successes. We'll look at this more closely later.

To create this worksheet, start by setting the global column width to 8. In *1-2-3* press slash, select Worksheet Global Column-Width, and enter *8*. (In *Symphony* press MENU, select Settings Width, enter *8*, and select Quit.) Enter the labels shown in column A. Begin the labels that are indented with one or two spaces. Don't worry about the meaning of the labels in range A10..A13. Assign the Percent format (in *Symphony*, %) with two decimal places to cells D6 and D17 and to ranges G8..G33 and H8..I8: Select /Range Format Percent (in *Symphony*, MENU Format %), press Return to accept the default of two decimal places, and specify the appropriate cell or range. Enter *0*, *4*, and *1/6* in cells D4, D5, and D6, respectively. Enter the following formula in cell D10:

```
@IF(D4=0,1,@ROUND(((1+0.08367334/
  D4)*D4^D4*@EXP(-D4)*(2*@PI*D4)^
  (0.5)),0))
```

Copy cell D10 to cell D11, then copy cell D10 to cell D13 and edit the formula in cell D13, replacing all occurrences of the characters D7 with D12. In cell D12 enter the formula +D5−D4. In cell D17 enter the following formula:

```
(D11/(D10*D13))*D6^D4*(1-D6)^(D5-D4)
```

The worksheet can now solve simple binomial probability problems. Let's try out the worksheet using the parameters from some simple probability problems. For example, what are the odds of flipping a coin twice and getting heads both times? You want to know the probability of two successes, so enter *2* in cell D4. You have two trials, so enter *2* in D5. Finally, enter the probability of success in one trial, *1/2*, in cell D6. The formulas in range D10..D13 perform some intermediate calculations necessary for computing the probability. Cell D17 displays 25.00%, the probability of getting heads twice in two flips.

To solve the sales manager problem, the number of successes is the number of sales made, 12. The number of trials is the number of calls made, 100. The probability of success in one trial is 25%. Enter *12* in cell D4, enter *100* in cell D5, and enter *.25* (or *25%*) in cell D6. Cell D17 displays 0.06%, the probability that 100 calls will result in exactly 12 sales.

Before going on, change the values in range D4..D6 back to 0, 4, and 1/6.

THE PROBABILITY TABLE

The table gives you a more complete listing of the probability information pertaining to a sampling problem. To set up the table, first enter the labels shown in cell F5 and in range G2..I5. Enter a backslash and a hyphen (\−) in cell G3, and copy cell G3 to range H3..I3. Enter a space followed by seven hyphens in cell F6, and copy cell F6 to range G6..I6. Center the labels in range F4..I5: Select /Range Label Center (in *Symphony*, MENU Range Label-Alignment Center) and specify range F4..I5. Enter *0* in cell F8, then enter this formula in cell F9:

```
@IF(F8+1>$D$5,@NA,F8+1)
```

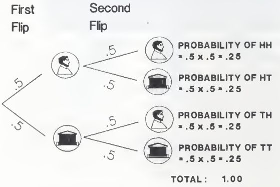
Copy cell F9 to range F10..F33. Enter these formulas:

Cell	**Formula**
G7	+D17
H8	@SUM($G$8..G8)
I8	@IF(F8>$D$5,@NA,1−H7)

Copy range H8..I8 to range H9..H33. Then assign

THE BEGINNINGS OF PROBABILITY THEORY

When you flip a coin, the probability of getting either heads or tails is 50%, provided the coin is fair. You compute the probability of getting two heads in two flips by multiplying the probabilities of each flip: $0.5 \times 0.5 = 0.25$. Drawing a probability tree may help you understand this process:


First Flip
Second Flip
.5
.5
.5
.5
.5
.5
PROBABILITY OF HH = .5 x .5 = .25
PROBABILITY OF HT = .5 x .5 = .25
PROBABILITY OF TH = .5 x .5 = .25
PROBABILITY OF TT = .5 x .5 = .25
TOTAL: 1.00

Note that the sum of the probabilities of all possible sequences must be 1.

Many probability historians maintain that two dice games played in 17th-century France led to the development of probability theory. The first game was simple, played with a single die. The house bet even money that a player would get a six at least once in four rolls. At that time, no one knew a good way to determine the probability of a player's winning. Experience showed that the game favored the house by a margin small enough to keep gamblers interested but large enough to ensure a steady profit.

This game was so successful that an extended version was developed. The player threw two dice and the house bet that a double six would appear at least once in 24 throws. People believed that the new game favored the house by the same margin as the first. Their reasoning went like this: The introduction of a second die increases the number of outcomes by a factor of six (any number on the first die could combine with any one of six numbers on the second die). Since the odds favor the house in the first game, the number of throws needed to get the same odds in the second game should be 4×6, or 24. If you agree with this reasoning, stay out of the casino business. The second game actually favors the player.

In 1654 a gambler, Chevalier de Méré, asked French mathematician Blaise Pascal to analyze these games. From Pascal's analysis and similar discussions came the science of probability theory. Others extended Pascal's work, including Swiss mathematician James Bernoulli. Bernoulli is usually credited with the formal development of the binomial distribution.

Here's a simplified version of Pascal's method: For the single-die game, Pascal drew a tree to show all the outcomes, assigned a probability to each branch, then multiplied the individual probabilities to get the final probability for each sequence. This tree would be too large to show here, but only one sequence is of interest anyway, that of rolling something other than a six four times in a row. The probability of getting a six on one roll is 1/6, or 0.1667. The probability of getting something else is therefore $1 - 0.1667$, or 0.8333. The probability of not getting a six four times in a row is $0.8333 \times 0.8333 \times 0.8333 \times 0.8333$, or 0.8333^4, or 0.4823. This is the probability that the player wins. The probability that the house wins is $1 - 0.4823$, or 0.5177. Thus the game favors the house, as experience has shown.

Another way to interpret these probabilities is to say that the house will win 51.77% of the games on average, and the player will win 48.23% of the time.

For the second game, each roll of two dice has 36 (6×6) possible outcomes. Drawing a probability tree for this game is out of the question. After 24 rolls, the probability tree has 36^{24} branches. There is still, however, only one sequence of interest. The probability of a double six on one roll is $1/36$, or 0.0278. The probability of not getting a double six is $1 - 0.0278$, or 0.9722. The probability of not getting a double six in 24 rolls is 0.9722^{24}, or 0.5086. Thus the game favors the player by a small margin. Fortunately for gaming houses, this game never caught on. But the game was important because it was the first application of probability theory.

the Fixed format with 10 decimal places to cell G7.

You update the Probability Table with the Data Table 1 command (in *Symphony*, the Range What-If 1-Way command). Although you don't actually see it happen, this command puts values from column F into cell D4 one at a time, then places the probability associated with each value next to it in column G.

Select /Data Table 1 (MENU Range What-If 1-Way in *Symphony*), specify range F7..G33 as the Table range, and specify cell D4 as the input cell. After a few moments, *1-2-3* or *Symphony* fills range G8..G12 with the values shown in the figure and range G13..G33 evaluate to NA.

Cell G8 shows you that the probability of exactly zero successes is 48.23%, as does cell D17. As you would expect, the probability of zero or fewer successes is also 48.23% and the probability of zero or more successes is 100%. The table also gives you these three probabilities for numbers of successes up to and including the number of trials. For example, row 10 tells you that there is an 11.57% probability of exactly two successes; a 98.38% probability of two,

You test 25 disk drives from a shipment of 1,000, and three fail. Will the entire lot be that bad?

one, or zero successes; and a 13.19% probability of two, three, or four successes.

When you change the values in range D4..D6, remember that the Probability Table does not automatically change. To update the table, assuming you don't wish to enlarge it, select /Data Table 1 (in *Symphony*, MENU Range What-If 1-Way) and press Return twice to accept the Table range and input cell you already entered. If you use *1-2-3*, you can reissue the table commands by pressing the TABLE key (F8 on most computers).

ANALYZING BUSINESS PROBLEMS

Before analyzing a problem with the binomial distribution, make sure the problem meets the following conditions:

1. There is a series of repeated independent trials. The outcome of an independent trial doesn't affect later trials.
2. Each trial has only two possible outcomes, usually called success or failure.
3. Each trial has a constant probability of success.

The nature of a trial depends on the problem. In the sales manager's problem, a trial is a sales call and a success is a completed sale. In coin flipping, a trial is a single flip and a success is heads, or tails.

Quality control is an important application of the binomial distribution. Suppose that your company manufactures PC clones. You buy floppy-disk drives from an outside supplier under a contract specifying a defect rate no greater than 1%. A new lot of 1,000 drives arrives. You test a random sample of 25 drives and three fail. Your sample has a failure rate of 12%, but will the entire lot be that bad? What's the probability of finding three defective drives in other 25-piece samples if the true defective rate in the lot is 1%?

The number of successes is 3, the number of trials is 25, and the probability of success in one trial is 0.01. Enter these numbers in range D4..D6 of your worksheet and press the TABLE key (in *Symphony* select MENU Range What-If 1-Way and press Return twice). The probability of getting exactly three defective drives in 25 trials is 0.18%. More important, cell I11 indicates that the probability of getting three or more defective drives per sample would be only 0.20% if the lot really had a 1% failure rate. You must conclude that your supplier is probably not meeting the contract specifications and that you should test the rest of the drives in the lot.

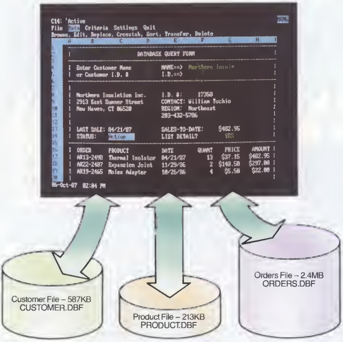
You can also use the binomial distribution to determine numbers of people to hire. Your records indicate that 75% of new employees complete your company's training program. You desperately need at least 10 new people trained and on the job. How many people must you recruit into your training program to be 95% certain of meeting that goal? The number of successes is 10, and the probability of success in one trial is 0.75. Enter these numbers in cells D4 and D6, respectively. Now experiment with cell D5. Enter *15* as the number of trials, and issue the table commands or press the TABLE key. According to cell I18, the probability of 10 or more successes is 85.16%. Try 16 trials and re-create the table. Cell I18 displays 92.04%. Try 17 trials and re-create the table. With 17 trials, the probability of 10 or more successes is 95.98%. You should recruit 17 people for your training program.

Use the worksheet to analyze the probabilities of loan losses. Here's a question that one banker answered with the binomial distribution. He knew from industry records that 1.5% of loans of a certain type would ultimately go into default. His bank held 41 loans of that type. Contingency planning at the bank depended heavily on whether any of these loans went into default. A vice president at the bank argued that the probability of taking a loss in this loan portfolio couldn't be much greater than 1.5% and was therefore insignificant. Of course, this is a faulty argument.

The banker needed to know the probability of 0 successes in 41 trials—or that none of the 41 loans would go into default—when the probability of success in one trial is 0.015. Plug the numbers into the worksheet and you see a probability of 53.81% in cell D17. Re-create the table and you see that the probability of taking a loss on one or more loans, cell I9, is hardly insignificant at 46.19%.

By now you should be able to think of your own applications for binomial distribution. Many ventures in business boil down to probabilities. After all, they're either successes or failures. If each trial holds a reasonably constant probability of success or failure, you can use the binomial distribution. If you don't have hard data about the probability of success in each trial, you can always make an assumption and do some sensitivity analysis to see how the probability affects your decision. ■

Everette S. Gardner Jr. is associate professor of decision and information sciences at the University of Houston, director of the International Institute of Forecasters, and coauthor of Quantitative Approaches to Management *(McGraw-Hill, 1988).*



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 1  ------------------------------------------------------------------
 2  |                    DATABASE QUERY FORM                         |
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 4  | Enter Customer Name          NAME==>  Northern Insul*          |
 5  | or Customer I.D. #           I.D.==>                           |
 6  ------------------------------------------------------------------
 7  |                                                                |
 8  | Northern Insulation Inc.     I.D. #:     17358                 |
 9  | 2913 East Sumner Street      CONTACT: William Tochio           |
10  | New Haven, CT 06520          REGION:  Northeast                |
11  |                              203-432-5786                      |
12  |                                                                |
13  | LAST SALE: 04/21/87          SALES-TO-DATE:     $402.95        |
14  | STATUS:    Active            LIST DETAIL?         YES          |
15  ------------------------------------------------------------------
16  | ORDER     PRODUCT            DATE        QUANT    PRICE   AMOUNT |
17  | AK13-2498 Thermal Isolator   04/21/87       13   $37.15  $402.95 |
18  | AK22-2487 Expansion Joint    11/29/86        2  $148.50  $297.00 |
19  | AK19-2465 Molex Adapter      10/26/86        4    $5.50   $22.00 |
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CIRCLE 116 ON READER SERVICE CARD

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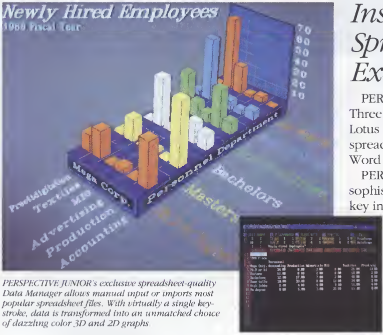

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CIRCLE 117 ON READER SERVICE CARD

FOCUS ON YOU

SPECIAL REPORT

Mid year we peppered the magazine with invitations to tell us about yourselves. On the pages that follow, you'll see the results of the ballot that 1,600 of you so kindly sent back, telling us what you like and don't like about *1-2-3*, Lotus, and the computer industry. You'll also meet some members of the greater *LOTUS* community. Some have heroically rescued managers in distress; others have been particularly creative with spreadsheets. We celebrate them. Maybe you know them. Maybe they're you.

KATE BRENNAN HALL

4 LOTUS HEROES

BY FRED HAPGOOD

MICHAEL GRECCO

Mark Porterfield is an industrial-strength Lotus hero who goes at it full-time. He works in the Information Center for Pacific Mutual in Newport Beach, Calif., where he answers questions on Lotus products. Porterfield disposes of 10 to 20 problems a day.

"My biggest kick is when people call up and sound all hesitant," he says. " 'I'd like to do this or that,' they say, 'but I don't see any way. I've tried everything. I can't find it in the manual. My office mate says *1-2-3* doesn't do it. It's hopeless, isn't it?'

Mark Porterfield
"Now that I have this reputation, people like to test me."

"And then I say, 'No, of course you can do it. Just follow this sequence,' and they type it out and there it is, right on the screen! I get such a kick out of that!"

The Information Center recently held a Lotus Day, with lapel pins, balloons, and demos. Porterfield teaches five company courses on *1-2-3*. On his last vacation he went to Cambridge, Mass., to visit Lotus's research library. He subscribes to both the American and British editions of *LOTUS*.

"Now that I have this reputation, people like to test me," he says. "Someone will ask some seemingly harmless question, like, 'Is there some way of changing colors within a spreadsheet?' 'Gee,' I'll say, 'I don't think so.' 'Wrong!' he'll say. 'Gotcha!' And he'll show me some complicated idea. And as he walks off I can hear him chuckling, 'I showed the guru something that time.' "

RIC FERRO

When Cathy Layton was hired as administrator of warranty service by Jordan & Chamberlain, a home builder in Florida, it was with the understanding that part of her job would be to get out into the company, talk to people, figure out how *1-2-3* might help them, and write whatever application would help. She was, in part, hired to be a hero.

One of the first people she talked to was Kay Combs, head of interior design. Jordan & Chamberlain builds luxury homes for customers who insist on a wide range of interior design options and the freedom to change their minds at any point. Combs had been cramming information about each client's choices into five typed, legal-size pages. "All that whiteout," she recalls. Layton created a spreadsheet that organized these choices right from the initial client interview.

She also created a model for critical-path analysis, showing which subcontractors had to be on-site and when. Her Project Status Report worksheet organizes reports from job superintendents so that the construction vice president can easily field questions from lenders, subcontractors, suppliers, and customers.

Cathy Layton
"I have everybody doing everything with macros."

"When I came here, there were maybe one-and-a-half people using computers," she says. "Now there are eight." Her secret? "Macros," she says. "I have everybody doing everything with macros."

You can't look up "Lotus Hero" in your company directory. Such talent—and dedication—may appear anywhere in the organization, from sales to quality control to the loading dock.

BERNARD BOHN

BRUCE ZAKE

The flour business may seem simple in principle—buy wheat, grind it, sell it—but it is old and complex, particularly in Canada. An elaborate thicket of rebate, discount, and credit practices has grown up among the mills, farmers, collectives, authorities, and transport vendors. Farmers have developed dozens of grades of wheat, each with its own prices, markets, and transport and storage costs.

Mike Goodfellow
"I figured I could really help him."

Grain-accounting systems must track hundreds of distinct material and product streams and remain flexible enough to react instantly to a pricing change by a market or supplier or government board.

"It was obvious to everyone that we had to put raw-materials accounting on computers," recalls Jim White, who's been in the flour business for 30 years, the last 10 as grain-accounting manager at Ogilvie Mills, in Montreal, "but I couldn't imagine how. Then I began to think about Mike."

Mike Goodfellow, now White's partner, was a regional accountant when White heard about him. Goodfellow says now, "I figured I could really help him." And he could. Over a year Goodfellow gradually built a grain-accounting spreadsheet that captures the sophistication and power of the traditional system and adds speed. It can reconcile a wheat cost of $10 million per month down to $500 of unexplained variance in minutes.

Glen Cooper works in the Replacement Parts Business Unit of Babcock & Wilcox, in Barberton, Ohio. The company makes equipment used to generate and transport power. His job is to plan and specify, graphically, the fastest possible routings that orders should take from the moment they arrive in the division.

When Cooper opened the *1-2-3* manual, he read it cover to cover. A little later he ran into Aletha Gardner, who worked in Customer Service. Every month, as part of a management report on shipping errors, she used *1-2-3* to sort the thousands of items shipped that month. The database was large, broken into a dozen units, and the entire sort took hours. Look, Cooper said, instead of running a sort on the whole thing, why not use a few macros to pull out and sort only the information you need? Gardner says that now she can put together her report in 30 minutes.

Glen Cooper
"This is just something I do on the side."

Don Gibson, manager of RP Quality Assurance, is responsible for tracking delivery errors by their causes. He devised a system that would do this, but it was slow and error-prone. When Cooper heard about Gibson's system, he wrote a worksheet that shrank preparation time by a factor of 30. "This is just something I do on the side," Cooper says. ■

Fred Hapgood wrote about the Japanese release of 1-2-3 *in the May 1987 issue.*

NOT YOUR BASIC MODEL

When we asked you to send word on unusual ways you use spreadsheets, we heard tales from land, sea, and sky. Here are a few of our favorites, as told to writer Donald Trivette.

UP FROM GALLEY SLAVERY

Before Hannelore Merry boards *Culebra*, she uses *1-2-3* to figure out how much food to take. Space is at a premium on the 35-foot sloop when Hannelore and her husband, Brad, sail out of Chesapeake Bay for long vacations.

The typical cruise might include some 50 meals, with six ingredients for each meal, which translates into a 300-line spreadsheet. Hannelore plans menus, then lists ingredients and quantities for each meal. Then she sorts the list and sums the quantities. She can then print out these sums and use them as her shopping list.

"I added a slop factor to compensate for spoilage, delays, and especially those unauthorized forays into the larder," she laughs. She allowed for a 20% margin of error on their first cruise, but found she could reduce it to 10% to 15%.

"We figure we save $100 to $180 per trip in provisions we don't buy," she says. In fact, the plan works so well that one of her friends asked her to provision a 51-footer for a crew of six.

The spreadsheet will get a real workout in a few years when the Merrys plan to take the trip all sailors dream about—a yearlong voyage.

HE KNOWS THE WAY TO SAN JOSE

When Terry Donovan taxis his single-engine, four-passenger Mooney out of its hangar in southern California, he takes with him a flight plan he created in *1-2-3*.

A flight plan lists way points along your route. It contains heading, time, distance, and fuel consumption for each leg of the trip, which you compare with the actual data as the flight progresses.

"It used to take me from 30 minutes to an hour to make a flight plan to Lake Tahoe," Terry says. "Now I do it in less than five minutes." He could subscribe to one of the flight-planning services used by commercial pilots, but they can cost hundreds or even thousands of dollars a year.

The spreadsheet uses trigonometric functions, macros, and a database. The database contains longitude, latitude, and other data on 400 way points, each of which is identified by a three-character Federal Aviation Administration designator. The pilot enters the designator for each leg and then queries the database for the longitude and latitude of a particular way point. After the longitude and latitude of all way points are entered, the program calculates the distance, time, fuel, ground speed, and heading needed to reach each point. The pilot can change any variable. Another macro prints the flight plan so that it can be filed with the FAA.

Accuracy? On a recent 536-nautical-mile, four-hour flight from Camarillo, Calif., to Grants Pass, Oreg.—an eight-leg trip—the plan was off by less than two minutes.

WATCH OUT, MTV

Cheryl Wilkinson used *Symphony* to put on a slide show for the open house celebrating her company's 50th anniversary. The accounting department of Hancock-Wood Electric Cooperative, in North Baltimore, Ohio, wanted to display several graphs, as well as a message that would get people's attention as they toured the building.

"This had to run without any operator intervention," Cheryl explains, so she wrote a 16-line macro to display eight screens, one after another. The screens tell the story in graphs that show the company's growth and financial position. One screen uses line, bar, and pie charts to show how the electric dollar is spent. Parts of the pie represent cost, margin, depreciation, and taxes. Another graph uses a bar chart to show margins.

KATE BRENNAN HALL

Using *Symphony*'s SERVICES Window Layout command, Cheryl can put as many as four small graphs on a screen. A {WAIT} command combined with the @NOW and @TIME functions makes each display pause for eight seconds. A {BRANCH} command causes the macro to loop, so the presentation keeps repeating.

To grab passersby at the open house, Cheryl used *Symphony*'s DOS add-in to execute a small BASIC program she had written. It plays a short tune and displays a message. The tune? "Beautiful Ohio," of course.

GRADE IN THE SHADE

Tony Beckman teaches one of the most popular courses in the Houston Community College data-processing department. The course introduces students to DOS, *dBase, WordPerfect*, and *1-2-3*. To cope with the course's popularity, Tony developed a *1-2-3* application to give and score exams.

"The program was born out of laziness," Tony admits. "It takes so much time to type, duplicate, give, and grade tests that I knew there had to be a better way—especially for a data-processing class."

His solution was to put the questions and answers in a spreadsheet. The questions are either multiple choice, true/false, or require precise words or phrases for answers. Students work through the quiz, pointing to and typing in answers. They can change any answer until the time is up, at which point the answers are frozen and scoring begins. Students get to see the results immediately and compare their answers with the correct ones.

The answers are stored in a hidden part of the spreadsheet. A macro compares the student's entries with the correct answers, calculates the grade, and automatically records it in a file that Tony imports into his grade sheet. Tony can turn in semester grades just hours after the final exam.

What keeps students from cheating and looking at the answers? "If they're smart enough to display the hidden ranges and find the answers," says Tony, "they probably deserve an A."

BETTER THAN DIVINING

Greg Sullivan's model for water-supply planning could save Denver a lot of effort in explaining water-shortage solutions to the public. He created the model for a seminar at the University of Colorado at Denver, where he is working toward a master's degree in civil engineering.

"Denver is actively pursuing new water sources for the future," says Greg. "It could buy existing water rights, construct reservoirs, or implement conservation measures. Those are just a few of the alternatives, and each one has a positive and a negative side. For example, a reservoir may store water for use during a drought, but it may also inundate the habitat of an endangered species."

His *1-2-3* model simulates combinations of alternatives. It uses 200K of memory for its 500 rows by 100 columns. It is menu-driven, easy to use, and produces both tables and graphs.

Built into the model are 30 projects with a variety of costs and completion times. All are actual water sources recently identified by a U.S. Army Corps of Engineers study. The simulation lets you choose which projects to implement at 10-year intervals. You then get to see the results of your decisions in 50 years. The goal is to maximize yield while minimizing environmental damage and cost, so the final score measures your success in those areas. There are severe penalties built into the model for failing to meet demand for water.

Greg and his fellow students demonstrated the model to the Denver Water Department, and the governor's office and other state agencies have shown an interest. And he got an A in the course. ■

Donald B. Trivette is a consultant and free-lance writer. He lives in Wrightsville Beach, N.C.

THE BALLOTS ARE IN

Here's what you think about 1-2-3, *Lotus Development Corp., and the industry.*

BY HENRY FERSKO-WEISS

The August issue of *LOTUS* included a tear-out questionnaire on the strengths and weaknesses of *1-2-3*, as well as on some computer-industry issues. More than 1,600 of you responded, giving us a clear picture of how our readership thinks and feels. Not surprisingly, you said that ease of use, flexibility, speed, and macros are the things you like most about *1-2-3*. You thought that graphics, database functions, and documentation needed improvement. You rebuked Lotus Development Corp. for the delay of *1-2-3* Release 3. Yet, in spite of this delay and the tempting new spreadsheet alternatives, you are still loyal to *1-2-3*.

More than half of you use add-in programs.

The survey painted an interesting portrait of *1-2-3* users. More than 80% of you have used the program for three or more years, making you a very experienced group. Fifty-four percent of you use add-ins, and among these programs, Funk Software's *Sideways* is by far the most popular, with Turner-Hall Publishing's *SQZ!* and *Lotus HAL* tying for second place. Lotus's *Speedup* and Personics Corp.'s *SeeMore* followed just behind. Your favorite non-Lotus software product is *WordPerfect*, followed by *dBase III*.

The popularity of *dBase* was to be expected, since many of you complained about *1-2-3*'s database functions. "I don't like the data-reporting features in *1-2-3*, so I use *dBase III*," said Glenn Smith in a follow-up interview. Smith is a geologist at Electra Exploration Corp., an oil-exploration firm in Edmond, Okla. "I would probably use *1-2-3* exclusively if it had better database facilities, such as the ability to extract totals easily."

Microsoft Excel, a competing spreadsheet product that has been in the limelight of late, tied with *Harvard Graphics* as the third most popular non-Lotus product among the experienced *1-2-3* users. Since this group represents 31% of all users, the message is clear: Lotus must start to match the graphic and printing richness of *Excel*, or it stands to lose a sizable number of its most loyal customers. This warning is echoed in other parts of the survey.

One reason more people haven't switched to either *Excel* or other spreadsheets is the time and effort it takes to learn a new product. "After using *1-2-3* for five years, I'm very familiar with the commands and comfortable with the features," said Leslie Morgan, a senior consultant at Arthur Andersen & Co., in Houston. "I don't want to go through a long retraining program," she added.

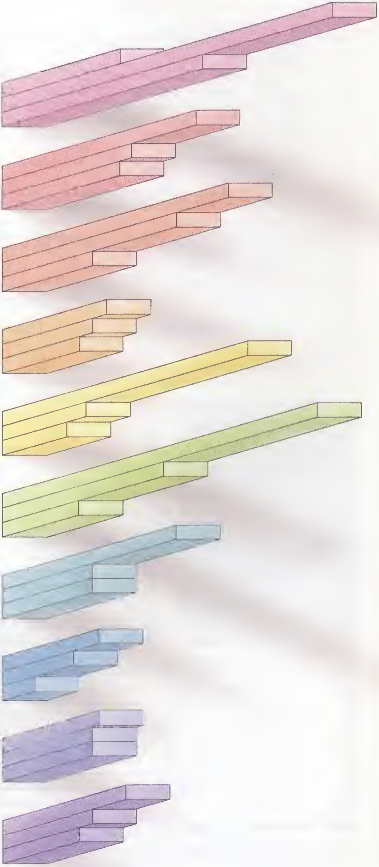
The retraining problem is magnified when the decision to switch involves a whole company. "With more than a hundred users, it becomes difficult to retrain everyone," said David Dunne, a systems analyst in charge of computing support at the Museum of Modern Art in New York City. "I know *1-2-3* can currently do what I need it to do, but I'm disappointed that Lotus isn't keeping pace better [with other companies]," he said. "If it doesn't catch up, I will switch, even if it's difficult," Dunne added.

In the hardware arena, Compaq and IBM computers tied for first place as your favorite. But it is worth noting that the popularity of IBM's computers is mostly among the least experienced *1-2-3* users. Over time, the allegiance to IBM drops off by a considerable percentage, while the acceptance of Compaq grows by almost the same percentage. Oddly enough, only 3% of you chose the Intel Above Board as your favorite hardware product. Perhaps DOS's 640K memory barrier is not as stringent a limitation as people in the industry commonly believe.

Only 1 out of 10 plan to switch to OS/2 within the next 12 months.

As a group, you are unimpressed with the prospects of OS/2. Only 30% of you thought that OS/2 would be beneficial, and only 11% intend to switch to OS/2 in the next year. These numbers may shock Microsoft and IBM. Both companies are banking on a wide-scale

SURVEY RESULTS



1. How long have you used *1-2-3*?
   - 18% Two years or less
   - 51% Three to four years
   - 31% Five years or more
2. What is the biggest business advantage of *1-2-3*?
   - 30% Speed
   - 20% What-if modeling
   - 18% Versatility
3. What do you like most about using *1-2-3*?
   - 35% Ease of use and help screens
   - 27% Versatility, flexibility, adaptability
   - 14% Macro capabilities, macro command language
4. What do you like least about using *1-2-3*?
   - 16% Poor-quality graphics
   - 14% Database and data-command limitations
   - 12% Graphics not integrated with spreadsheet
5. What is the hardest *1-2-3* feature to master?
   - 38% Data Query commands
   - 13% @Functions
   - 10% Macros
6. What is the most notorious vaporware product you've heard about?
   - 49% *1-2-3* Release 3
   - 25% *OS/2*
   - 12% *dBase IV*
7. What is your favorite add-in program?
   - 27% *Sideways*
   - 14% *Lotus HAL*
   - 14% *Sqz!*
8. What is your favorite non-Lotus software product?
   - 15% *Word Perfect*
   - 11% *dBase III*
   - 5% *Harvard Graphics* and *Microsoft/QuickBASIC* (tied for 3rd place)
9. What annoys you most about the PC-software industry?
   - 15% Poor documentation
   - 14% Expensive products
   - 14% Too many changes and updates
10. If you had the chance, what would you tell Lotus Development Corp.?
    - 19% Keep up the good work.
    - 14% Lower the price.
    - 12% Don't get smug — others are out there.

DAVE HANNUM

shift to the OS/2 environment, but it may take a lot more market education and cajoling to make this happen.

When we asked you to name your favorite *1-2-3* features, ease of use was the top choice by a wide margin. Historically, this has been one of *1-2-3*'s great strengths. "The program is easy to use because the basic commands and functions are straightforward and intuitive," said Jim Wendel, accounting officer at Douglas National Bank in Roseburg, Oreg.

1-2-3's macro capability was the third most liked feature, and it was also the most frequent answer to the question about useful features in *1-2-3*. However, macros came in third as the hardest feature to master. The reason for this apparent contradiction is that using macros requires that you think like a programmer. "The macro language lets us accomplish our tasks more completely and easily, but it's very difficult to understand how to look for syntax problems and how to correct them without blowing the whole macro," said Dunne, from the Museum of Modern Art. "It takes three months of intense, constant use to become competent. I wonder why the macro command language can't be more English-like, as it is in *Paradox* [a database program from Borland International, reviewed in this issue]."

When we asked you to name your favorite 1-2-3 *features, ease of use was the top choice by a wide margin.*

1-2-3's graphics and database functions were most often named as the least liked and the least useful features. In fact, you named these two as the least useful features so frequently that no other answer had much statistical weight. Not surprisingly, graphics and database functions also topped the list of *1-2-3* functions you would like to change.

The graphics facilities are too primitive, you said. "If you ask children to draw a person, they will draw a stick figure with no shadows—no sense of three-dimensionality," said Donald Kraft, of Donald Kraft and Associates, a PC consulting firm in Skokie, Ill. "*1-2-3*'s graphics are similar—they are stick-figure charts." Kraft, who programs many stock market applications, also complains that *1-2-3* can't create the basic high-low-close-open graph.

"*1-2-3* was the first spreadsheet to come out with integrated graphics, which was great," said Hans Stork, a researcher at IBM's facility in Yorktown Heights, N.Y. "But it hasn't maintained its standards. Now, in comparison to other programs, its graphics are poor."

Because many of you believe *1-2-3* Release 3 will take care of the graphics problem, it was natural for you to complain about the delay in getting Release 3 to market. In fact, you labeled Release 3 the most vaporous of vaporware products.

The questionnaire invited you to speak directly to the brass at Lotus Development Corp. Overall, the largest percentage of you said that *1-2-3* was great and that Lotus should keep up the good work. However, most of you who said this were newer *1-2-3* users. Those who've been using the product for three or four years had a lot less praise for Lotus's top brass, and veterans of five years or more gave even less kudos. The most experienced *1-2-3* users were more apt to suggest that the company lower the price of *1-2-3* and its upgrades. "$150 for an upgrade is a little stiff, especially when you buy from 30 to 40 packages," said Ken Spanola, a computer specialist at Metropolitan Life in Tampa, Fla.

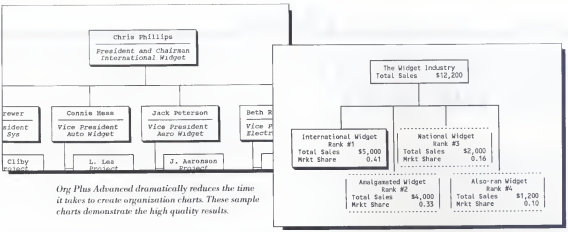
Graphics and database functions topped the list of 1-2-3 *features you would like to change.*

Also high on the list of soapbox comments was the need for better manuals and tutorials. This is consistent with complaints about the software industry as a whole and suggests that Lotus is as guilty as the rest of the industry. "People who have never been exposed to *1-2-3*, or any spreadsheet, are totally lost when they pick up the *1-2-3* manual," said David Zwingman, a senior engineering specialist at the Ford Aerospace Corp. in Houston. Zwingman also teaches the use of *1-2-3* at a local junior college in the evenings. "My students have trouble finding what they're looking for in the manual if they don't know a command name," he said.

Our follow-up interviews with those who wrote left us with the overwhelming impression that you think *1-2-3* is a good product that needs some fixing here and there. Your loyalty is intact, even with the blemishes.

But you want upgrades to be better, more frequent, and less expensive. You want to see Lotus recapture the forward-looking inspiration that made *1-2-3* the industry standard. ■

Henry Fersko-Weiss is a free-lance writer who is not a 1-2-3 *user.*



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CIRCLE 118 ON READER SERVICE CARD

QUESTIONS YOU'VE ASKED THE MOST

This month's letters are unsigned because so many of you have asked these questions.

1-2-3/SYMPHONY

SEVEN PARTS IN A PAGE

Q. When I specify top and bottom margins of zero, why does my printout still leave blank space at the top and the bottom?

A. A printed *1-2-3* or *Symphony* page consists of the following seven parts:

1. The top margin can have the following lengths: 0–10 for *1-2-3* Release 1A and *Symphony* Releases 1 and 1.01; 0–16 for *Symphony* Releases 1.1, 1.2, and 2; and 0–32 for *1-2-3* Release 2/2.01.
2. One line is reserved for a header, whether or not you enter one.
3. The top spacer consists of two blank lines that separate the header from the body.
4. The body varies in length and is the content of your Print range. The body also includes any Border options (Top-Labels and Left-Labels in *Symphony*) that you may define.
5. The bottom spacer consists of two blank lines that separate the footer from the body.
6. One line is reserved for a footer, whether or not you enter one.
7. The bottom margin can have the same lengths as the top margin (see Number 1).

The page-length setting defines the total number of skipped and printed lines setting on a page. Although the default setting is 66 lines, allowing 6 standard-height lines per inch on 11-inch paper, you can change it to up to 100 lines.

1-2-3 and *Symphony* automatically reserve six lines on each page for the header, footer, and spacers, and you control the number of lines for the top and bottom margins. Using this information, you can calculate how many lines of a spreadsheet will fit on one page. Note that if you select /Print Printer Options Other Unformatted (in *Symphony*, SERVICES Print Settings Page Breaks No), headers, footers, and page-break margins will be suppressed. If you insert a page-break code on the worksheet by selecting /Worksheet Page (in *Symphony*, MENU Page in a DOC window), the printer will move to the top of a new page when it reaches that code, no matter how much space is left on the current page.

PART OF FILE MISSING

Q. While retrieving a worksheet file, I received a *Part of file is missing* error message and could not retrieve that particular file. The rest of the files on the disk were fine. What could have caused this error, and what could I have done to retrieve my file?

A. You get the *Part of file is missing* error message for any of the following reasons: The data disk has been damaged; the file did not close properly because of a power surge or some kind of interference while you were saving it; you tried to create a print file (PRN) and neglected to close the file properly (by selecting Quit from the main Print menu). Try the following ideas to salvage your file:

1. If it's a print (ASCII text) file, use a text editor to add Control Z (^Z) at the end of the file. This won't work with worksheet files because they're not in ASCII format.
2. If you have a backup copy of the data disk, use that copy as your starting point and update it. This is often easier than recovering a lost file.
3. If you don't have a backup copy, try retrieving the file, then pressing the Escape key after you receive the error message. Some of your file may be in RAM. Save this data with a new file name on another disk. Use this as a starting point to rebuild your file.
4. If every data file you attempt to retrieve displays this error message, then the disk's File Allocation Table, which keeps track of each file's location, could be damaged. Use step 2 or 3 on each file, or try a file-recovery product such as *The Norton Utilities*. If you can retrieve all other data files without getting an error message, copy them onto another disk and check each file for accuracy. Part of the damaged file may be attached to another file.
5. If all retrieved files display this message, you could be having a problem with your System Disk (Program Disk in *Symphony*) or your machine. Try your system backup disk to check if the program is damaged. To see if your computer is causing the problem, try saving files on another machine using *1-2-3* or *Symphony*.

FINDING CIRCULAR REFERENCES IN WORKSHEETS

Q. Occasionally, the *Circ* indicator appears at the bottom of a *1-2-3* Release 1A worksheet. Because I work with very large worksheets with many calculations, it may take an hour or so to discover what's causing the circular reference. Can you suggest an easier way?

A. Circular references occur when a cell's value directly or indirectly depends on itself. Whenever *1-2-3* detects a circular reference in a worksheet that uses natural order of recalculation, the

Circ indicator appears at the bottom of the screen. In *1-2-3* Release 2/2.01 select /Worksheet Status and check the Circular Reference item to determine in which cell the circular reference begins. In *Symphony* select MENU Settings and check the Circular item.

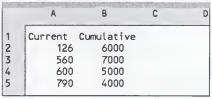
There are three ways to find a circular reference in a *1-2-3* Release 1A worksheet.

1. Recalculate the worksheet and save the file that contains the circular reference by placing the cursor in cell A1 and selecting /File Save. Now recalculate the file using the CALC key. Select /File Combine Subtract Entire-File, and specify the file you just saved. All cells that involve a value or calculation will evaluate to zero because subtracting a value from itself will evaluate to zero. Most cells that contain the circular references will not evaluate to zero since *1-2-3* cannot accurately compute these cells. However, if the cells already evaluate to zero, ERR, or NA before the extract, they will still evaluate to zero, ERR, or NA, respectively.
2. Use *1-2-3* Release 2/2.01 or *Symphony* to locate circular references in a *1-2-3* Release 1A worksheet. Both products display the address of a cell that contains a circular reference. In *1-2-3* Release 2/2.01, when you select /Worksheet Status (MENU Settings in a *Symphony* SHEET window), you can check to see which cell contains a circular reference. If you eliminate the circular reference from one cell, also check for other problem cells, because the status screen can display only one circular reference at a time.
3. Save the file that contains the circular reference, then begin to delete rows from the bottom of the active worksheet. Start by deleting a large chunk of rows. If the *Circ* indicator disappears, you know that the rows deleted contain the circular reference. Retrieve the file you saved before you deleted the rows, and delete a smaller range of rows to see if it contains the circular reference. If it does, continue retrieving the file, deleting rows until you find the problem row.

CUMULATIVE TOTALS

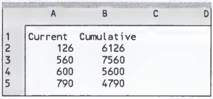
Q. In one of our worksheets, we need to enter numbers repeatedly into column A and have column B display the cumulative total. If in column B we place a formula that adds column A to column B and then we recalculate the worksheet, column B adds all of the numbers in column A a second time. How can we set up our spreadsheets so that previous entries in column A are not erroneously re-added?

A. To accumulate in column B entries made in column A, enter the current values into the input area, which in the following example is range A2..A5.



```
       A          B          C       D
1  Current   Cumulative
2      126       6000
3      560       7000
4      600       5000
5      790       4000
```

Then try the following technique to create cumulative totals: Press slash (in *Symphony,* SERVICES), select File Xtract Values, enter a file name, and specify the range A2..A5. Move the cell pointer to cell B2 and select /File Combine Add Entire-File (in *Symphony*, SERVICES File Combine Add Entire-File Ignore Values). Then specify the file name that contains the extracted values from column A. After this procedure, your file will look like this:



```
       A          B          C       D
1  Current   Cumulative
2      126       6126
3      560       7560
4      600       5600
5      790       4790
```

Because column B cells no longer contain formulas that reference column A, changing the numbers in column A will not affect column B. You can automate this process with a macro.

THE IMPORTANCE OF ALIGN

Q. When I tried to print a worksheet, the printer inserted several blank lines into the body of the worksheet, dropping my data down so that my file would not fit on one page as it should. The worksheet is 60 lines long, top and bottom margins are set to zero, and page length is set at 66 lines. A coworker instructed me to select Align before Go on the Print menu to resolve this problem, and that worked.

A. If you manually move your printer paper to the top of a page, selecting Align resets the program's internal line counter to zero. From then on, you don't need to move your printer paper manually.

NAMING AND SAVING GRAPHS

Q. I am having trouble naming and retrieving graphs. Please describe how to retrieve a graph into the worksheet so that I can change it and how to print a graph using PrintGraph.

A. You are confusing two processes. When you name a graph, you attach the graph's settings to the associated *1-2-3* or *Symphony* worksheet. The graph's specifications will be saved and retrieved along with the worksheet. You can view, change, and review named graphs. On the other hand, when you save a graph, you create a copy of it separate from the worksheet and send it to another file that has a PIC (picture) file-name extension. Once in a PIC file, the graph data cannot be changed. However, you can print it using PrintGraph.

You can create and name as many graphs for each worksheet as your computer memory allows. To name a graph, select /Graph Name Create (in *Symphony*, MENU Graph 1st-Settings Name Create). The next time you issue the File Save command, the named graphs will be saved along with the worksheet. Remember to save the file after naming the graph.

Although a worksheet can have many named graphs, you can view only one graph at a time. Select the View command and you will see your current graph. The current graph is the last one you created or the last one you selected with the Graph Name Use command. With *Symphony* you can simultaneously display multiple graphs by attaching them to separate GRAPH windows.

To print a graph using PrintGraph, save the image in a separate PIC file by selecting /Graph Save (in *Symphony*, MENU Graph Image-Save). You can't retrieve PIC-file graph settings back into a worksheet for revision. You must change the named settings, then resave the image.

If you want to preserve a graph's settings in association with a worksheet for later use and revision and you also want to print a graph, you must both name the graph and save the graph. After you name a graph, make sure you save the worksheet file.

MEMORY AND DISK ALLOCATION CONFUSION

Q. I have a large worksheet that takes up 196,941 bytes on a disk. *Symphony* implies that the file takes up only 125,737 bytes of RAM by listing the memory available as 94,023 bytes of 219,760. Why does this happen?

A. When you select SERVICES Settings, *Symphony* displays the amount of available RAM. Don't confuse RAM with disk space. The difference between the size of your file on disk and its size in RAM depends on the contents of the cells and the placement of the information in your worksheet.

Both *1-2-3* Release 1A and *Symphony* Release 1 allocate RAM as follows: All cells inside the current workspace (between Home and End Home), including blank cells, require a minimum of 4 bytes. Integers between −32768 and 32767 use 4 bytes. Real (decimal) numbers use 12 bytes. Labels use 6 bytes for the first four characters, plus 1 byte per subsequent character. A 10-character label uses 12 bytes (6 + 10 − 4). Formulas use a minimum of 30 bytes. The more complex the formula, the more memory it uses. Range names use 32 bytes each, regardless of the name's length. Graph names use 461 bytes each, regardless of options.

Symphony Releases 1.1, 1.2, and 2.0 and *1-2-3* Releases 2 and 2.01 allocate memory differently from previous product releases. They evaluate the worksheet column by column. Memory use starts with the first four-cell block in a column to contain an entry and ends with the last four-cell block in that column to contain an entry. Active cells use a minimum of 4 bytes each.

For example, let's assume that you loaded *Symphony* Release 1.1 and that your computer has 293,053 bytes of conventional memory available. (The first 640K of RAM is conventional memory.) Enter *1* in cell A1. Select SERVICES Settings and note the number displayed for conventional memory (293,037). The entry uses 16 bytes of RAM because the program considers the first four cells in column A to be the only block of active cells. If you now enter *1* in cell IV8192, the entry uses another 16 bytes, which leaves 293,021 bytes of conventional memory available. The entries at cells A1 and IV8192 use a total of 32 bytes of RAM because the program ignores everything except the two four-cell blocks, A1..A4 and IV8189..IV8192. But if you enter *1* at cells A1 and A8192, the entry uses 32,768 bytes (32K) of RAM. The program allocates memory from the first cell entry in column A to the last cell in that column containing an entry.

Despite their more efficient use of memory, *Symphony* Releases 1.1, 1.2, and 2.0 and *1-2-3* Releases 2 and 2.01 can allow unused cells to consume memory. You can reduce the amount of RAM your worksheets use by designing your worksheets in blocks of four cells and in a rowwise formation. *Symphony* Release 2.0 stores range names, settings sheets, and program data—such as menu text and associated long prompts, window names and locations, and database settings—in expanded memory. The program uses 4 bytes of conventional memory to mark every cell stored in expanded memory.

Files may take up more space on disk than in RAM because integers take up substantially more bytes on disk than in RAM. Blank cells do not use disk space in any version of *Symphony* or *1-2-3*.

COPY, ADD, OR SUBTRACT

Q. When is it appropriate to use the Copy, Add, or Subtract options with the File Combine command?

A. The File Combine command is useful in combining data or entire worksheets from different sources or in accumulating similar sets of data.

Use the Copy option when you want to replace a range in your current worksheet with a range from another worksheet, or when you want to append a range or worksheet to your current worksheet. The Copy option will begin copying wherever you've positioned the cell pointer at the time of combining, so be careful not to overwrite any data. If incoming cells are blank, the current values remain intact. Position the cell pointer in the upper-left corner of the range in which you want to place the incoming file. Be sure to save the current file before you combine another file into it. This will reduce the consequences of a mistake such as overwriting needed cells from the current file.

Use the Add or Subtract options when you want to consolidate numbers, that is, to add or subtract a group of values in one file to or from a group of values in another file.

The Add option adds incoming values to the numeric values in the current worksheet. If an incoming value overlays a cell containing a numeric value, *1-2-3* and *Symphony* add the two values. If the incoming value overlays a label or a formula, *1-2-3* and *Symphony* ignore the incoming value and leave the label or formula undisturbed.

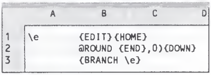
The Subtract option subtracts incoming values from the numeric values in the current worksheet. *1-2-3* and *Symphony* consider blank cells to have a value of zero, so positive incoming values subtracted from a blank cell produce negative values (for example, 0 − 240 = −240).

ROUNDING

Q. When I change my worksheet format of currency with two decimal places to currency with zero decimal places, the whole-dollars totals do not add up the same as the original decimal totals.

I know this is a rounding problem, but how can I get my whole-dollars report to add up correctly and still keep the cents in the spreadsheet for the necessary accounting detail without having to use the @ROUND function on every number?

A. Both *1-2-3* and *Symphony* store numbers as you entered them, even if you display them in a different format. It is only after you use an @function that the program stores the number the @function returns. To get the results you wish, you must use either the @INT or @ROUND function on each number you sum. You may want to use a keystroke macro to do the conversion for you. The following figure shows such a macro:



```
        A         B         C         D
1   \e        {EDIT}{HOME}
2             @ROUND {END},0){DOWN}
3             {BRANCH \e}
```

Specify the label in cell A1 as the range name for cell B1: With the pointer in cell A1, press slash (in *Symphony*, MENU), select Range Name Labels Right, and press Return. To use the macro, place the pointer on the first cell in the column of numbers to be rounded, and start the macro by holding down the MACRO key (Alt on most computers) and pressing E. To stop the macro, hold down the Control key and press Break. Here's how the macro works:

{EDIT}{HOME} Places the formula in Edit mode and moves the cursor to the first character of the formula.

@ROUND({END},0){DOWN} Enters *@ROUND(* at the beginning of the formula, skips to the end and enters *,0)* to complete the function, then moves the cell pointer down one row.

{BRANCH \e} Branches back to cell B1 to restart the process. In *1-2-3* Release 1A, replace this statement with /XG\e~.

TRUNCATED LEGENDS

Q. I have a problem using PrintGraph. Whenever I print more than two long legends, the printed version chops off the left and right legends. However, the monitor displays all the legends in the proper places. PrintGraph works fine if it's working with only two legends or if each legend is fairly short. What's up?

A. Depending on the release of *1-2-3* or *Symphony*, type of graph, font selection, and number of legends, there is a limit to the number of characters you can print. For example, if you create a bar graph that has six ranges, you'll probably want six legends. With *Symphony* Releases 1.1, 1.2, and 2.0, you can use 19 characters per legend, regardless of the number of legends. Follow these guidelines to keep legends from truncating:

1-2-3 RELEASES 1A, 2, 2.01

Bar and Stacked-Bar Graphs

Number of legends	Total characters
6	15
5	21
4	27
3	33
2	38
1	19

1-2-3 RELEASES 1A, 2, 2.01

Line and XY Graphs

Number of legends	Total characters
6	18
5	24
4	30
3	36
2	38
1	19

SYMPHONY RELEASES 1, 1.01

Number of legends	Total characters
6	23
5	27
4	31
3	35
2	39
1	43

PrintGraph prints graphs stored in a PIC file. A PIC file has more detail than your monitor can display, so the printed graph's scaling will differ slightly from the monitor. See the March 1987 Tech Notes column "Tricks with *1-2-3* and *Symphony* Graphs" for more useful graphics tips.

SYMPHONY

PRINT SELECTED DATABASE RECORDS IN SYMPHONY

Q. Is it possible to output database reports of selected records using *Symphony*?

A. Assuming that you created a database in a FORM window using the MENU Generate command, you can select MENU Criteria Edit to control which records appear in the database report. If you subsequently want to print all records, you must delete all criteria. The Criteria Ignore command doesn't affect report printing.

A second method is to enter the following formula under a blank field in the Criterion range, where *rownum1* equals the row number of the first record you want to print and *rownum2* equals the row number of the last record you want to print:

@CELL("row",!fieldname)>=
rownum1#AND#@CELL("row",
!fieldname)<=*rownum2*

CONTEST

NEW CONTEST

This month we ask users of *1-2-3* Release 2/2.01 and *Symphony* to create a formula that returns the number of weekdays between two dates. The formula should return 1 if the start day and the stop day are the same. The total number of weekdays should include the start day and the stop day, except for start or stop days that fall on weekends.

For example, make sure that the formula returns 1 if the start day is Friday, September 2, 1988, and the end day is Friday, September 2, 1988. If the start day is Friday, October 14, 1988, and the end day is Monday, October 17, 1988, the formula should return 2. If the start day is Saturday, September 3, 1988, and the stop day is Sunday, September 4, 1988, the formula should return 0.

The first 25 people who submit entries that the *LOTUS* judges consider the best answer will receive a *LOTUS* flight bag. Please send your answer on a nonreturnable disk along with a printout of your contest entry, documented with the number of characters in the formula. All entries must be postmarked before midnight, December 31, 1988. Winners will be announced in the March 1989 issue. Send your answers to December Contest, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.

If you have a contest idea you would like us to print, send it to Contest Idea, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Please include your solution documented with appropriate comments. We'll pay $200 if we use your contest idea (and your proven solution). We'll pay $25 for a contest idea without a solution.

This material is prepared by the Technical Editors, with the help of the Lotus Product Support staff.

WRITE US

Do you have a question? We can't answer every letter, but if yours is selected, we'll publish it along with an answer or a request to other readers for advice. We'll pay $25 for each letter we publish. Send your letters (including your address and daytime phone number) to: Q&A, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

GOOD IDEAS

THE BEST READER TIPS ON USING LOTUS PRODUCTS

This month's letters are unsigned because so many of you have submitted these ideas.

1-2-3/SYMPHONY

COPYING CELLS AND SKIPPING ROWS

I used to think that the only way to copy a cell to numerous rows while leaving every other row blank was to copy one cell at a time. However, I found a trick that lets me do this more easily.

For example, if I want to copy a formula from cell A2 to every other row through cell A20, I select the Copy command, the program prompts me to enter the From range, and I indicate range A2..A18. When it prompts for the To range, I indicate cell A4. The program quickly copies one cell at a time. First it copies the contents of cell A2 to cell A4, then it copies cell A3 to cell A5, cell A4 to A6, and so on, down to row 20. Reduce the size of the From range by two rows, or by three rows if you are copying entries to every third row; otherwise, the formula will be copied to the second, or the third, row beyond the last row you specified. To skip more than one row, move down the number of rows you want to skip when you indicate the first cell of your To range.

This procedure copies formulas, as well as labels, values, and cell formats.

AVOIDING FORMAT-COMMAND DISASTERS

I use the DOS FORMAT command to prepare new floppy disks. I store the command in the hard-disk root directory of my IBM PC XT, and I enter *format a:* to properly invoke the command. This formats the floppy disk that is in drive A. If the floppy disk has been used, the command erases everything on the disk before reformatting it. However, the most dangerous risk is forgetting to include *a:* in the command, which would cause the command to erase and reformat the current disk, which is drive C—my hard disk. This is the stuff nightmares are made of.

To avoid such a disaster, I wrote a batch file that ensures that I format only floppy disks. First, in the root directory of my hard disk, I used the DOS RENAME command to change the name of the file *format.com* to *killdisk.com*. Then I created a batch file by entering the following:

```
copy con:format.bat
killdisk a:
^Z
```

To create ^Z, hold down the Control key and press Z, or if you use an IBM PC, press the F6 key.

To format a disk, I still type *format* at the DOS prompt, but I no longer worry about the drive designation. The batch file performs the rest of the work safely and automatically.

EXTENDING THE FUNCTION OF THE NAME KEY

The NAME key has great functionality when you combine its use with any command that requires a display of range names. This feature appears to be undocumented in the *1-2-3 Reference Manual*.

For example, when you press the GOTO key followed by the NAME key, *1-2-3* displays a list of range names in the control panel. If you press NAME again, *1-2-3* displays all the range names on the screen. You can use the NAME key to toggle back and forth between the control panel and the full-screen display of range names. To select a range name, use the Arrow keys to move the cell pointer to the desired name and press Return. You can also use the Home, End, PageUp, and PageDown keys to navigate among the range names.

The NAME key is especially useful when a worksheet contains more range names than can fit across the control panel. You can use this technique to get a full-screen display of range names with any *1-2-3* command or command sequence that works with a named range, including Copy, Move, Print Printer Range, Range Name Create, and Range Name Delete.

With some File commands, such as Save, Retrieve, Combine, Xtract, Erase, List, and Import, you can also use this NAME-key feature to toggle between the limited display of file names in the control panel and the full-screen display of file names. (The File Erase and List commands give you a full-screen display of the type of files you specify.) As you move the cell pointer to highlight each file name in a full-screen display, *1-2-3* shows the date and time the file was created, as well as its size. If the default directory lists subdirectories, you can highlight a subdirectory and press Return to get a listing of that subdirectory's files. You can then press the NAME key to toggle between the control panel and a full-screen display of the file names in that subdirectory. To select a file, place the cell pointer on the file name and press Return. In *1-2-3* Release 1A, the NAME key will not display a full-screen list of range names or file names.

Even though *Symphony* doesn't have a NAME key, this feature works equally well in a *Symphony* SHEET window when you follow the desired command by pressing the MENU or SERVICES key. (However, if you use the GOTO key, you must press the MENU key. The SERVICES key won't work in this situation.)

DOS COPY WARNING!

Imagine that you are in DOS, that the DOS prompt is visible on your screen, and that you attempt to copy a file from disk 1 in drive A to disk 2 in drive B. Also imagine that you mistakenly insert a program disk in drive B and then enter *copy a:file.ext b:*. You're in luck—you left the write-protect tab on disk 2, and DOS gives you the error message *Write protect error writing B: Abort, Retry, Ignore?*

What should you do? Most people exchange the program disk in drive B for a data disk and select either *Retry* or *Ignore*. However, if you do this, you're in for trouble.

One of the first things DOS does when you issue the COPY command is to read and store the file-name directory of the target disk. In fact, DOS does this even before checking to see if the target disk is write-protected. Thus, if you remove the write-protected disk, insert the second data disk, and select either *Retry* or *Ignore*, the COPY command continues where it left off. The file directory of the removed disk replaces the one on the newly inserted disk. Because the directory no longer reflects the actual contents of the current disk, you cannot access any of the files unless you use the DOS RECOVER command or a recovery program, such as *The Norton Utilities* (Peter Norton Computing, Santa Monica, Calif.).

To solve the problem, select Abort, change disks, and issue the COPY command again.

PREVIEW BEFORE PRINTING

Here's a quick way to preview the page breaks in *1-2-3* worksheets prior to printing. Select /Print File, and enter the file name CON, which corresponds to the DOS device console—your screen display. You are asking DOS to print the file to your computer's display. *1-2-3* displays a message that the file already exists. Enter *r* to replace the existing file. Specify your Print range and print settings, then select Align Go. The formatted contents of your Print range scroll up the screen.

The screen can display only 80 characters on one line, so lines that are longer than this wrap to a second line. You can identify page breaks as gaps between sections of text. All the format options, except specified setup or initialization strings, appear as they would in a printed version. To suspend the scrolling temporarily, hold down the Control key and press S. To continue previewing the document, press Control-S again. To stop previewing, hold down the Control key and press C, then press the Escape key to clear the error. After the entire range is printed to the screen, the program redraws the worksheet display when you select Quit from the Print menu, press the GRAPH key, and then press Escape.

You can also preview printing in *Symphony*. Select SERVICES Print Settings Destination File, and enter the file name CON. Select Source and specify the range or database you wish to print. Then choose Quit Align Go. *Symphony* automatically redraws the screen after you choose Quit from the Print menu.

THE CALENDAR CAPER

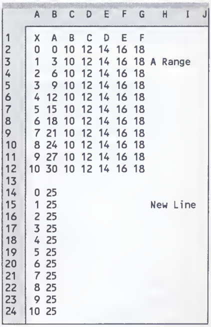
A Renaissance pope may be responsible for a minor error in *1-2-3*'s calendar. The original version of the Julian calendar, introduced in 46 B.C., had a quadrennial extra day in February, based on the assumption that the solar year is precisely 365¼ days long. However, the earth actually takes several minutes less than 365¼ days to get fully around the sun. So by 1582 the calendar was out of sync by about 10 days.

As a result, Pope Gregory XIII devised the version of the calendar now in use. He decreed that only the centennial years that are divisible by 400 would be leap years. This meant that 1700, 1800, and 1900 were without an extra day in February. However, *1-2-3* accepts @DATE(00,2,29), which is February 29, 1900, as a valid date. I realize that this has little significance in day-to-day computing, but it's nice to know that the Lotus software engineers didn't think of everything.

All releases of *1-2-3* and *Symphony* incorrectly treat 1900 as a leap year. Thanks to Pope Gregory XIII, the year 2000 is a leap year. *1-2-3* Release 1.0 couldn't handle dates beyond this century, so the year 2000 wasn't an issue. Release 1A doesn't treat 2000 as a leap year. However, *1-2-3* Releases 1A*, 2, and 2.01 and all releases of *Symphony* correctly consider 2000 a leap year. If you don't know whether you have *1-2-3* Release 1A or 1A*, you can find the asterisk indicating that you have 1A* on the copyright screen, which appears between the Access menu and the worksheet.

HOW TO GRAPH MORE THAN SIX DATA RANGES

I have often lamented *1-2-3*'s [and *Symphony*'s] limit of six data ranges in graphing. Happily, I've discovered how to create a *1-2-3* graph with virtually an unlimited number of lines. I'll illustrate the technique with an XY graph.



	A	B	C	D	E	F	G	H	I	J
1	X	A	B	C	D	E	F			
2	0	0	10	12	14	16	18			
3	1	3	10	12	14	16	18	A Range		
4	2	6	10	12	14	16	18			
5	3	9	10	12	14	16	18			
6	4	12	10	12	14	16	18			
7	5	15	10	12	14	16	18			
8	6	18	10	12	14	16	18			
9	7	21	10	12	14	16	18			
10	8	24	10	12	14	16	18			
11	9	27	10	12	14	16	18			
12	10	30	10	12	14	16	18			
13										
14	0	25								
15	1	25						New Line		
16	2	25								
17	3	25								
18	4	25								
19	5	25								
20	6	25								
21	7	25								
22	8	25								
23	9	25								
24	10	25								

In a conventional six-range graph, range X might be A2..A12, with range A as B2..B12, B as C2..C12, and so on, as shown in the example. To set up a graph with more than six lines, repeat the X-range values, leaving a blank cell between each set, and enter the new corresponding values as a continuation of the other ranges. In the example shown, the X range has been extended to A2..A24, the A range has been extended to B2..B24, and the other ranges

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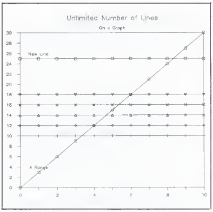
have been left unchanged. Specify the graph type as XY.

The following graph shows the result, with the A-range extension plotted at the top as the seventh line. You may



want to add data labels to the graph, as I have, since both the original A line and the new line will be printed in the same color and use the same symbol. In *1-2-3* select Graph Options Data-Labels A, specify range H2..H15, and select Above. In *Symphony* select MENU Graph 1st-Settings Data-Labels A, specify range H2..H15, and select Above.

You may create additional lines by extending ranges B through F in the same way range A was extended or by again repeating the X-range values.

COPY RELATIVE FORMULAS WITH SAME REFERENCES

I need to copy several formulas that contain relative cell references, but I want the copied formulas to contain the same references as the originals. I could change the cell references from relative to absolute, but I want to be able to copy them later and have the cell references act as relative ones.

Before copying the formulas in question, I change them into labels in the following manner. I position the cell pointer on the cell that contains the formula, press the EDIT key, press the Home key to move the cursor to the leftmost end of the formula, type an apostrophe, and press Return. The apostrophe converts the formula to a label, which I can copy to any location without having it change.

After copying the label, I must convert both the original and the copy back into formulas. I do this by repeating the procedure described above: With the pointer on the label, I press EDIT Home, delete the apostrophe, and press Return.

I can simplify this procedure by using the macro {EDIT}{HOME}'~ to convert the formula to a label. To convert the label back to a formula, I use the macro {EDIT}{HOME}{DELETE}~.

However, if I need to duplicate a large range, the previous methods are too time-consuming.

Suppose my worksheet occupies range A1..E10 and I have a group of formulas in range E1..E10 that I would like to duplicate in range E15..E24. I use the following procedures:

1. Make a temporary copy of the formulas in an unused section of your worksheet, such as in range AA1..AA10. Press slash, select Copy, and specify E1..E10 as the From range and cell AA1 as the To range.
2. Use the Move command to move the original formulas from range E1..E10 to the new location, cell E15. This command maintains the original cell references in the formulas.
3. Copy the temporary formulas from range AA1..AA10 back to the original location, range E1..E10. The relative references will automatically be converted to their original values.
4. Use the Erase command to erase the temporary formulas in AA1..AA10.

I now have identical sets of formulas in two locations and was exempted from retyping or editing them one at a time.

To perform any of these commands using *Symphony*, I press the MENU key instead of slash. With either program, when I move the formulas, I take care not to move them onto any cell that is referenced by the copied set of formulas; otherwise, the copied set returns ERR.

SYMPHONY

JUMP TO A CHARACTER'S NEXT OCCURRENCE

I recently stumbled upon a useful word-processing feature in *Symphony*. After pressing the ERASE key (F4 on most computers) and while highlighting a range to erase, I accidentally struck the letter A. The highlighted range immediately expanded forward to the next occurrence of A in my text.

I discovered that during any word-processing operation that involves highlighting a block of text, such as the Move and Copy commands, if you press a letter key, the highlighted area will expand to the next occurrence of that letter and will continue to expand to the next occurrence each time you press the letter. This method also works with nonalphabetic characters, such as a dollar sign or the special print-attribute symbols.

This material is prepared by the Technical Editors, with the help of the Lotus Product Support staff.

WRITE US

Do you have a favorite technique or way of using 1-2-3, Symphony, or other Lotus product? Share it! We'll send you $25 if we print your letter. Send them to: Good Ideas, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

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PARADOX 2.0

Here's proof: Versatility and ease of use *can* combine well with power.

BY BILL LAWRENCE

CATY BARTHOLOMEW

Paradox offers a combination of power and ease of use that makes it an excellent choice if you are selecting your first relational database manager. It comes in four versions: *Paradox 2.0* for DOS, *Paradox OS/2* for OS/2, *Paradox 386* for 80386 machines running DOS, and *Paradox Network Pack* for use on local area networks.

If you have reached an intermediate level of proficiency with another database, switching to *Paradox* will likely accelerate your transition to an expert database user. Tools such as a keystroke recorder, an application generator, a report generator, and an entry-form designer let you create sophisticated applications without programming. In addition, the program's visual interface makes it easier to use than many of its competitors.

If you already write programs with some other database, changing to *Paradox* is less likely to reward you. Compared with *dBase III Plus*'s or *R:Base*'s programming tools, *Paradox*'s application-development language offers some welcome additions, including a debugger, menu-building facilities, and support for arrays. However, the extra features probably aren't sufficient to sway you from one of those programs. You won't have many work-saving, third-party enhancements, such as compilers and libraries, to choose from either.

Only one circumstance would rule out *Paradox* as an option: if you must directly read data stored in database files on mainframes or minicomputers. Unlike some of the more powerful PC databases, including *R:Base*, *Oracle Database Add-in for 1-2-3*, and *Informix DataSheet Add-in*, *Paradox* does not offer a way to do that.

VISUAL IS BETTER

The adage "A picture is worth a thousand words" describes *Paradox*'s user interface. Visuals accompany most operations, and that helps you remember critical steps.

Querying a database table is a typical example. After you select the table you wish to query, *Paradox* displays a table with field names only. You press a function key to put check marks in the fields you want to appear in the output of your query. If you have one or more criteria to apply, you write it directly in the appropriate field. For example, if you are querying an inventory database and want to list all items with a quantity on hand of less than 10, move the cursor to the *Quantity on hand* field and enter < *10*. Then tell *Paradox* to process the query.

Other key tasks use the visual approach as well. To design a report or create a data-input screen, enter your text on the screen where you want it to appear in your report or input form. If you are less experienced, you'll appreciate the program's default report and input-screen designs. Even if you modify them, they will help you to understand how to use the input-form designer and the report generator and to minimize the amount of work you must do.

Beneath *Paradox*'s generally placid waters lurk a few hazards. Keeping a sorted table in order and specifying multitable queries are cases in point.

Most database managers allow you to keep the database in sorted order as you insert new records, and *Paradox* is no exception. However, *Paradox* can do that only if the database field used to order the records, called the key field, contains no duplications. For example, if you want to keep your inventory database ordered by part number, *Paradox* would have no problem because each part number would be unique. Howev-

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Bill Lawrence is a network engineer at Southern California Edison Co.

er, if you want to order the database on the basis of some field that doesn't typically contain unique entries, you can't do it. In that case, *Paradox* forces you to designate an additional key field or fields so that, in aggregate, the designated fields in each record constitute a unique entry. This is a case of the program imposing its requirements on the user, rather than the other way around.

The problem doesn't end there. If you mistakenly enter a record whose key field or fields duplicate an existing record's, you'll have more trouble. Without either warning you beforehand or notifying you afterward, *Paradox* removes the existing record from the file you are working on and transfers it to a temporary table that it creates to store such records.

Multitable queries use the same visual approach as single-table queries but are more complex. In fact, without detailed knowledge of the program's query syntax, you can easily query for the wrong records. Since multitable queries often involve complex relationships, it may be difficult to see your mistake by reviewing the result. This area of the program should be improved, either by simplifying the current approach to querying or by adding an implementation of Structured Query Language.

APPLICATION-DEVELOPMENT TOOLS

Paradox includes three application-development tools: the Personal Programmer, the script recorder, and the *Paradox* Application Language (PAL). They will serve you whether you are a database novice, an expert programmer, or an intermediate user.

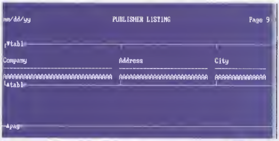
Most impressive of these is the Personal Programmer. It steps you through the creation of an application, prompting you to design a screen containing a menu and to define the actions that should occur in response to each menu item. Using the Personal Programmer, you can construct simple applications, such as a mailing-list manager, in less than 30 minutes.

A *Paradox* script replays keystrokes, as does a simple *1-2-3* or *Symphony* macro. To create scripts more easily, *Paradox* can record your keystrokes while you perform an operation you wish to automate.

You can use PAL to enhance the lines of program code that you produce with either the Personal Programmer or the script recorder. PAL is a high-level programming language that resembles *dBase*'s language. It has capabilities that are absent from most other database development languages, such as powerful menu-building and screen-formatting commands, a debugger to identify errors in your programs, and support for arrays.

PAL is particularly strong when it comes to building menus. One command, Showmenu, requires only a few lines of code to create a Lotus-style menu. You can get even more sophisticated results using *Paradox*'s Data Entry Tool Kit. The Tool Kit is a library of prewritten PAL procedures that create pop-up windows and more.

The language also has its shortcomings, but they are few. While you work, you'll find it frustrating that PAL's editor can't cut and paste text. After you finish writing your program, if you want to

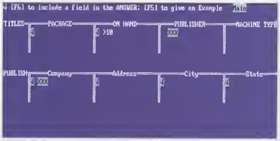


```
mm/dd/yy                    PUBLISHER LISTING                    Page 9

┌▼tabl
Company                          Address                    City
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAA
└▲tabl

─▲pag
```

A powerful report generator eliminates the need for programming in all but the most unusual circumstances. The border on the right side of the screen divides this page from the one located to the right.



```
√ [F6] to include a field in the ANSWER; [F5] to give an Example   Main
TITLES═╤═PACKAGE═╤═ON HAND═╤═PUBLISHER═╤═MACHINE TYPE
       │ √       │ √ >10   │ XXX       │
PUBLISH╤═Company═╤═Address═╤═City══════╤═State═
       │ √ XXX   │ √       │ √         │ √
```

When you select one or more tables from which to make a query, *Paradox* displays a blank form for each table. You can check the fields you want to include in the query's output and specify criteria.

PARADOX OS/2 AND DOS PERFORMANCE COMPARISON[1]

	Paradox for OS/2[2]	Paradox for OS/2[3]	Paradox 2.0 for DOS
Importing and exporting *1-2-3* files			
Import a 3,500-row, 5-column *1-2-3* worksheet	5:19	4:23	5:12
Export 3,500 rows to a *1-2-3* worksheet	:55	:30	:51
Tests of a small table (3,500 records)			
Index the table	:41	:30	:30
Sort the table on:			
one field	1:08	:07	1:03
two fields	1:09	:29	1:04
Find an unindexed record	:07	:07	:05
Find an indexed record	instant	instant	instant
Tests on a large table (21,000 records)			
Index the table	5:27	4:49	4:45
Sort the table on:			
one field	16:04	5:54	7:04
two fields	17:08	6:34	7:22
Find an unindexed record	:38	:38	:25
Find an indexed record	:01	:01	:01

[1] Tests were performed on a Wyse 286 PC running at 10 MHz with 3.6 megabytes of RAM and either IBM OS/2 Version 1.0 (using the default installation configuration) or MS-DOS Version 3.1. The same hard disk was used for both OS/2 and DOS tests. Times are shown in minutes and seconds.

[2] Default configuration

[3] Configured to use 2 megabytes of RAM

distribute it to others who don't have *Paradox*, you will have to purchase a separate run-time module. Those modules are inexpensive, $29.95 for the OS/2 version and $9.95 for the DOS version, and their licenses let you make an unlimited number of copies without incurring further charges. Given all of that, it's surprising that the modules aren't included in the package. A compiler, which turns your programs into applications that don't require a run-time module, would be even better.

SIX PEOPLE CAN USE PARADOX NETWORK PACK AT ONE TIME.

Like the rest of *Paradox*, the application-development tools are well documented and relatively easy to learn. The manuals are clear, and in the case of PAL, examples of actual code accompany each command.

The *Paradox* designers were so sensitive to the needs of database novices that the product comes with no less than three tutorials, one of which is a guide for *1-2-3* users. The guide introduces basic *Paradox* operations in the context of their *1-2-3* counterparts. The tutorial steps you through importing a *1-2-3* worksheet into *Paradox*, then familiarizes you with basic functions such as querying, relating tables to each other, sorting, and printing.

Paradox lets you both import and export *1-2-3* and *Symphony* files, as well as files produced with *dBase* and *PFS File* or those stored in ASCII comma-delimited format. However, *Paradox* can't import a range from a worksheet, as *R:Base* can. In the case of most of the worksheets you'd want to import into *Paradox*, which contain some spreadsheet data along with a database, that forces you to take an extra step. You'll have to extract and save as a separate file the portion of the worksheet containing your database before you can import that database into *Paradox*.

Another limitation is *Paradox*'s inability to preserve all Lotus numeric formats when you import worksheet data into *Paradox*. Values formatted with Percent and Fixed formats, for example, will lose those formats. Worksheet cells containing formulas translate as values only and not, as you might expect, as calculated fields.

THE OS/2 FACTOR

Paradox is one of a small but growing group of PC databases that come in both an OS/2 version and a DOS version. A recent *LOTUS* magazine review of another such database program, *R:Base*, showed that the OS/2 version ran most tasks more slowly than did the DOS version. Similar tests comparing *Paradox OS/2* with *Paradox* for DOS show that *Paradox OS/2* runs more slowly than the DOS version unless you first allocate more memory for it. Once you've done that, *Paradox OS/2* runs some operations much faster than the DOS version does (see table).

The OS/2 version features commands that control memory usage, that automatically initiate *Paradox* in another OS/2 session, and that let the two *Paradox* operations communicate and share data. For example, while *Paradox* running in one OS/2 session prints a report, it could request that *Paradox* running in another OS/2 session index a table. That's a broader spectrum of functions than you get in the OS/2 version of *R:Base*.

Those capabilities make *Paradox OS/2* a good buy if you do the heavy database work that benefits from multitasking. For the present, however, the choices of other applications to run under OS/2 are slim, so your multitasking options will probably be limited to doing some other task with *Paradox* instead of using another program. The only other significant liability to consider is *Paradox OS/2*'s steep hardware requirement. You'll need an 80286- or 80386-based computer and at least 3 megabytes of RAM.

If your office PCs are connected through a local area network (LAN), you can share *Paradox* tables with your coworkers over that network and create multiuser applications. The standard package permits just one user at a time to run the program. *Paradox Network Pack* lets up to six people use the program simultaneously.

If you use *Paradox* interactively, that is, not under the control of a PAL program, *Paradox* will automatically prevent more than one person from simultaneously changing the same data. Further, the program attempts to lock users out of no more data than it needs to. So if one person updates a record in a table, the only portion of that table that will be unavailable to other users is the record under revision. *Paradox* locks the entire file only if another user tries to rearrange the entire file, perhaps by sorting it, while someone else is modifying a record.

Paradox has a unique feature for use with LANs and for running multiple sessions under OS/2. To show you any changes others have made to the records you are viewing, the program updates the screen at intervals you select.

This program meets the needs of a broad range of users. New users can attain results quickly by following well-designed visual prompts, while skilled programmers will find a powerful programming language at their command. *Paradox*'s only serious lack is its inability to access data on non–PC-based systems (minicomputers and mainframes). Unless you have this special requirement, this product merits your serious consideration. ■

IN BRIEF

Paradox 2.0. Borland International, 1800 Green Hills Rd., Scotts Valley, CA 95066-0001; 408-438-8400. Runs on the IBM PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher, 512K of RAM, two floppy-disk drives, or one floppy-disk drive and a hard disk. Released 5/87. $725. 60-day warranty against defective disks. *Paradox Runtime*, $9.95 for license to distribute an unlimited number of copies.

Paradox Network Pack. Six users per package, $995.

Paradox OS/2. Runs on the IBM PC AT, PS/2 model 50 or higher, and compatible 80286- or 80386-based computers. Requires OS/2 1.0 or higher, 3 megabytes of RAM, one high-density floppy-disk and one hard-disk drive. Released 5/88. $725; $99.95 for upgrade from *Paradox 2.0* or *Paradox 386*. 60-day warranty against defective disks. *Paradox Runtime for OS/2*, $29.95 for license to distribute an unlimited number of copies.

Paradox 386. Runs on IBM PS/2 Model 80, Toshiba T5100, a computer equipped with the Intel Inboard 386 or the Intel Inboard 386/PC, and any compatible 80386-based computers equipped with a hard disk and a single high-density floppy-disk drive, 1.5 megabytes of RAM with memory above 1 megabyte configured as extended memory. Requires DOS 3.0 or higher. Released 1/88. $895.

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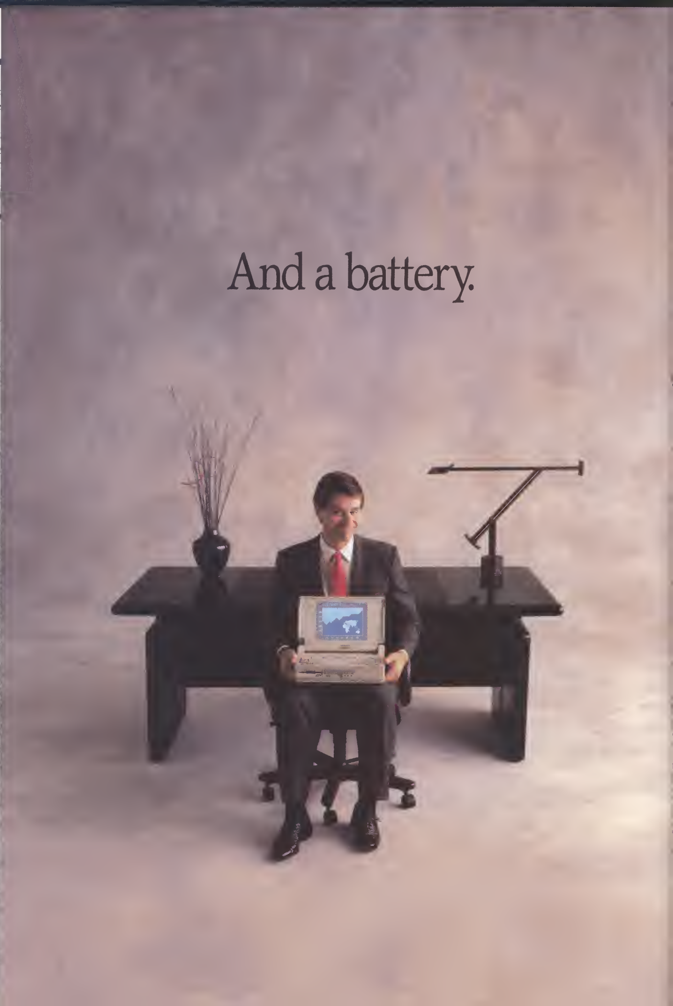

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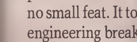

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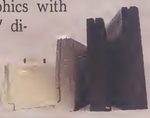

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DELTA-MANAGER

Analyze the risks in your business plans and budgets.

BY TOM CARLTON

If you must evaluate the impact an uncertain business climate could have on your budget, investment analysis, or business plan, *1-2-3* alone may not suffice. *1-2-3*'s Data Table command can handle the task if you need to vary only one or two values, such as when you evaluate how different interest rates affect mortgage payments. But when your analysis involves more than two variables, you'll need more help.

It's possible that *Delta-Manager*, a risk-analysis add-in for *1-2-3*, can do the job, but only if you meet several requirements that constrain the scope of applications for which it's useful.

Your input variables must be independent, and you must be able to plot their distribution as a bell curve. Those requirements are a significant limitation because many business problems involve dependent input variables. Although the program can handle some circumstances that include dependent variables, it can do so only if you specially design your worksheet.

Even if you use no dependent input variables, you will probably need to specially design your worksheet to use it with *Delta-Manager*. That also means you must make substantial changes to preexisting worksheets before you use them with *Delta-Manager*.

If you design a worksheet improperly, *Delta-Manager* will still return results, but they will be inaccurate. Further, it may be very difficult for you to know that the result is wrong and to detect the underlying problem in the model.

Although the manual does explain how to design a worksheet properly, it remains a daunting task to construct a model so that *Delta-Manager*'s results correctly reflect the business relationships that are embodied in the model. Extensive knowledge of statistics and risk analysis is a prerequisite for using the program safely.

For applications that fall within its scope of abilities, the program lets you easily explore a wide array of business scenarios. You do this by specifying a range of variation, such as plus or minus 10%, for one or more values on your worksheet. This range of variation is called the uncertainty interval. In return, the program calculates both the most likely value and the uncertainty interval for each dependent value on the worksheet.

For example, suppose you've designed a business-plan worksheet for use with *Delta-Manager*. You enter the uncertainty intervals for raw material prices, inflation, project capital, and sales. *Delta-Manager* reports the most likely values and the uncertainty intervals for cash flow and profitability.

The program can report uncertainty intervals in any of three formats. It can modify the worksheet display to show uncertainty intervals as plus or minus a percentage (for example, +/−10%), as plus or minus an absolute value (for example, +/−10), or as an interval (for example, 90<x<110). As an alternative, you can have the program create a line graph of its results (see the figure). For each variable, the graph shows the most probable value at the intersection of the horizontal line and each of the vertical lines. The vertical lines represent the uncertainty intervals.

OTHER USES

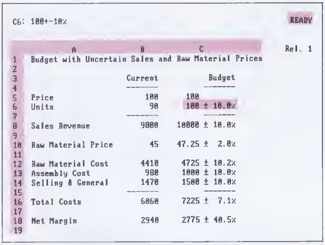
Delta-Manager can replace Monte Carlo–simulation techniques if you have normally distributed, independent input variables. In fact, using *Delta-Manager* in such circumstances has a decided benefit: It's 100 to 1,000 times faster than Monte Carlo–simulation programs, depending on the number of

Tom Carlton is manager of Corporate Business Analysis at CF Industries.

CATY BARTHOLOMEW

iterations a particular program performs.

You can also use *Delta-Manager* to perform sophisticated sensitivity analyses with more than one input variable. Keep in mind that the results you obtain by using combinations of input variables are exact only to the degree that those input variables are independent of each other. *Delta-Manager* may yield useful outcomes even when input variables are not strictly independent, but you must have a background in statistics to know when you can rely on the results.



```
C6: 100+-10%                                                READY

        A                B              C                   Rel. 1
 1  Budget with Uncertain Sales and Raw Material Prices
 2
 3                    Current          Budget
 4                    -------         -------
 5  Price                 100      100
 6  Units                  90      100 ± 10.0%
 7                    -------         -------
 8  Sales Revenue        9000    10000 ± 10.0%
 9
10  Raw Material Price     45    47.25 ±  2.0%
11
12  Raw Material Cost    4410     4725 ± 10.2%
13  Assembly Cost         900     1000 ± 10.0%
14  Selling & General    1470     1500 ± 10.0%
15                    -------         -------
16  Total Costs          6060     7225 ±  7.1%
17
18  Net Margin           2940     2775 ± 40.5%
19
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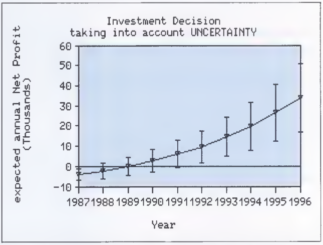

The worksheet in the figure on the left illustrates the problems that arise when you apply *Delta-Manager* to a preexisting worksheet. The profit and loss statement wasn't constructed with *Delta-Manager* in mind, and the program is reporting a 40.5% uncertainty interval. The result should be about 12.5%. In the figure on the right, *Delta-Manager*'s modified line graph offers another way to view uncertainty intervals.

Most of the time, however, the program requires that variables be independent and that the uncertainty intervals for those variables represent normal probability distributions. If your input variables fail on either count, *Delta-Manager* may understate or overstate the uncertainty intervals it calculates for the rest of the variables.

For example, suppose you are working with a budget and enter uncertainty intervals for unit sales and selling prices. *Delta-Manager* calculates the uncertainty interval for total revenue, based on the assumption that the selling price does not affect the amount of sales. However, if you are selling in a competitive market, where an increase in prices may result in a decrease in unit sales, the program overstates the uncertainty interval for total revenue.

If your variables are dependent, or if you can't represent them as a bell curve, you should probably turn to a program that does risk analysis using Monte Carlo simulation. In a future issue we'll review two such programs: *@Risk* (Palisade Software Corp., Newfield, N.Y.) and *Simulated Solutions* (Enfin Software, San Diego, Calif.).

PERFORMANCE

Performance problems may interfere with some of your applications, but you can work around them once you grow accustomed to the limits they impose. The most serious problem may occur when you work with a large worksheet that contains input variables that affect a large portion of that worksheet. In this case, *Delta-Manager* requires at least as much additional worksheet space as the unmodified worksheet occupies.

Further, a bug in *Delta-Manager* may cause your computer to lock up and require you to restart it. The problem is apparently triggered when you attempt to load a large, complex worksheet. However, the problem could also occur if you have *Delta-Manager* attached while you increase the size of an existing worksheet.

Of less concern, but somewhat annoying, is the slower recalculation speed that you will experience using *Delta-Manager* with *1-2-3*. I measured recalculation speeds that ranged from almost identical to *1-2-3*'s to as much as 10 times slower. On the average, *Delta-Manager* takes about twice as long to calculate an uncertainty interval as *1-2-3* takes to recalculate the unmodified worksheet.

Delta-Manager's recalculation speed sometimes will slow down drastically when the program encounters complex formulas containing the @NPV function. The slowdown even occurs in a simple worksheet if I enter an @NPV function that takes the net present value of a single cell instead of a range of cells. Granted, that's an unusual application, but it is a feasible one.

Installing the program for use on either a hard disk or a floppy disk is a simple process. Learning to use the program is another matter. Before you use the program, you should know the fundamentals of risk analysis because that knowledge will help you discern when you should and when you should not use *Delta-Manager*. While the documentation tells you when you should not use the program, incorrect answers are not self-evident. For that reason, use the program only if you're skilled in risk analysis and statistics. If *Delta-Manager* were as easy to apply as it is powerful, it would be useful to a much broader range of business users. ■

IN BRIEF

Delta-Manager Version 1.03. PC Publishing, 1801 Avenue of the Stars, Los Angeles, CA 90067; 800-634-4555. Available on 5¼-inch disks; runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires *1-2-3* Release 2/2.01 and 35K of RAM plus 20K for *1-2-3* Add-In Manager. Released 3/88. $149.95. Not copy-protected; 30-day, defective-disk warranty.

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GRAPHPAD, SIGMA-PLOT, AND TECH*GRAPH*PAD

Finally, technical graphs that meet the needs of scientists and engineers

BY PETER G. AITKEN

If you want graphs to illustrate your engineering or scientific application, you'll be disappointed in most of the business graphics programs that are regularly reviewed in *LOTUS*. Those packages lack special graphics elements, such as error bars and Greek symbols, and have no support for complex mathematical scales and curve fitting.

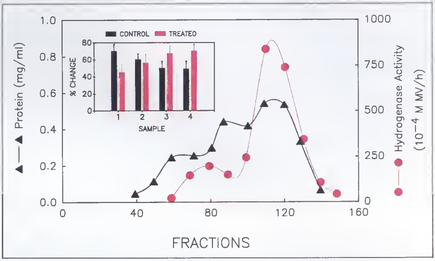
You can get these features only in programs designed specifically for engineering and scientific applications. Three such packages—*Sigma-Plot, GraphPad*, and *Tech*Graph*Pad*—can plot publication-quality graphs suited to many technical applications. The programs are all menu-driven and, considering their complexity, are relatively easy to learn.

Still, you must choose among them carefully. The programs differ significantly and none outperforms the others in all applications. Each program has unique strengths.

Sigma-Plot grants you the most control over the design of your graphs. When it comes time to print or plot, you can choose among the greatest number of output devices.

*Tech*Graph*Pad* alone lets you create polar plots (also called r-theta plots). It imports data from more sources than the other two programs, and it can produce two kinds of files that are compatible with many desktop-publishing programs.

GraphPad lets you precisely plot graphs onto preprinted documents. When it comes to transforming your data, such as converting degrees Celsius into degrees Fahrenheit, *GraphPad* offers the widest variety of transforms.



This graph illustrates some of the special features used in scientific and technical graphs, including error bars, multiple Y axes, inset graphs, data smoothing, and superscripts in labels. The graph was produced with *Sigma-Plot*; an essentially identical graph could have been produced with either *GraphPad* or *Tech*Graph*Pad*.

GRAPH DESIGN

All three programs can produce line and scatter graphs with linear, semilogarithmic, and logarithmic axes. Each program can incorporate Y error bars, multiple X and Y axes, and graph and axis labels that include Greek symbols, subscripts, and superscripts. *Sigma-Plot* and *GraphPad* can also produce bar graphs; *Tech*Graph*Pad*, as mentioned previously, can do polar plots. *Sigma-Plot* and *Tech*Graph*Pad* can plot X as well as Y error bars. *Sigma-Plot* and *GraphPad* can automatically create explanatory legends by adding plot symbols, line types, and colors or patterns to the appropriate data labels.

With *Sigma-Plot* and *Tech*Graph*Pad*, you create a complete graph on your screen and then plot it. If you subsequently need to change or add to the graph, you return to the on-screen editing mode. At any point, you can save the entire graph in a disk file and later resume working where you left off. If you want to use your data to create more than one graph, you can save that data in a file separate from the graph settings. You can also use an existing graph as a template by loading new data into it. The new data will replace the existing data to create a new graph.

GraphPad operates quite differently. Instead of designing an entire graph and printing it, you design one element of the graph and plot it, then move to the next element and plot it, and so on. After you've plotted all your data, you might add labels.

GraphPad's approach is a two-edged sword. Its major advantage is that it lets you selectively add to a graph or document that's already been printed. You can annotate an existing graph or place a new graph as an inset on a page of preprinted text. Its primary drawback is

Peter G. Aitken is an associate medical research professor at Duke University Medical Center in Durham, N.C.

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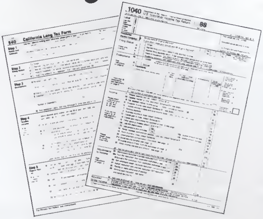

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that you can't save an entire graph to disk in a single file. That means that if you have to make only minor modifications to an existing graph, you'll have to repeat many of your previous steps. Surprisingly, that's also the case if you need to plot even one extra copy of the graph. There simply is no easy way to make more than one copy of the graph. If you have to perform either of these tasks regularly, you'd be better off with *Sigma-Plot* or *Tech*Graph*Pad*.

However, when it comes to labeling your graph, *GraphPad* comes out on top. Although it isn't the only program to let you control the location, size, and rotation of your graph, it is the only one that lets you specify rotation in increments of one degree. *GraphPad* alone lets you include an unlimited number of labels in your graph and draw arrows on the graph to call attention to important features.

A *Sigma-Plot* graph can have as many as 20 labels, which can reside anywhere on the graph. You can make each label practically any size; rotate it 90, 180, or 270 degrees; and center, right-justify, or left-justify it.

Of the three programs, *Tech*Graph*Pad*'s labeling capabilities are the least flexible. Graphs created with *Tech*Graph*Pad* can have X-axis and Y-axis labels, a header, a footer, and eight labels of up to 60 characters in length each. Only four label sizes are available in the program, and except for Y-axis labels, you can orient the labels only horizontally.

MERGING GRAPHS, CURVE FITTING, AND DATA SMOOTHING

Placing more than one graph on a plotted page, a process known as merging graphs, is a common requirement. *GraphPad*'s interactive method of plotting gives you the most control over this process. You plot, one at a time, the elements of the graphs you want to merge on your paper. You can see where to position the graphs, their points of overlap, and their size.

With *Sigma-Plot* and *Tech*Graph*Pad* you must design and save two or more graphs individually, then combine them on one page. With *Sigma-Plot* you cannot edit graphs while placing them together on the screen, but you have complete control over the size, aspect ratio (height and width), and position of each graph.

*Tech*Graph*Pad*'s approach is cumbersome. During the merge process, it doesn't let you control the graphs' size, aspect ratio, or position on the page. Therefore, you must properly set each of these dimensions when you individually design each graph. Unfortunately, it's easier to make such decisions when you merge the graphs because only then can you see the effects of each choice.

These programs differ significantly in their options for curve fitting and data smoothing. Curve fitting requires that you observe the positions of the data points on a plot and pick an appropriate equation to represent them, such as a first-order polynomial. The program will then try out different values in the equation until it reaches what it determines is a good fit. Data smoothing connects data points with smooth arcs instead of with straight lines.

Only *GraphPad* provides several measures of the "goodness of fit" between the data and the generated curve. These include the *r* and root-mean-square statistics and residuals plots. The program limits polynomial fits to first and second order, but also offers exponential and hyperbolic fits. It has cubic spline and Savitzky-Golay methods of data smoothing.

*Tech*Graph*Pad* can fit a curve using first-order through fifth-order polynomials and exponential and power functions. It offers three data-smoothing methods: cubic spline, Bezier, and Savitzky-Golay. *Sigma-Plot* can fit a curve using first-order through tenth-order polynomials, and it can smooth data using the cubic-spline method.

As you graph data, sometimes it's helpful to alter mathematically, or transform, the X or Y values according to a particular equation, as, for example, when you want to convert Celsius units to Fahrenheit units. *GraphPad* offers a total of 16 data transforms, including linear, logarithmic, trigonometric, exponential, and normalization transforms. *Sigma-Plot* and *Tech*Graph*Pad* are both limited to linear data transforms of the form $X = AX + B$, where you specify the coefficients A and B.

HARD COPY

All three programs work with Hewlett-Packard serial plotters and serial plotters that are compatible with the Hewlett-Packard Graphics Language (HP-GL), such as those from Roland and IBM. *Sigma-Plot* offers the most options in this area. According to the manufacturer, it also works with Houston Instrument plotters, HP LaserJet printers, PostScript printers such as Apple's LaserWriter, the Bell & Howell CDI-IV and Matrix film recorders, and a variety of dot-matrix printers. Although the vendor doesn't claim to support the

COMPARISON CHART: TECHNICAL GRAPHICS FEATURES

	Sigma-Plot	Tech*Graph*Pad	Graph-Pad
Hard-copy output:			
Plotters	✓	✓	✓
Laser printers	✓	✓	
Dot-matrix printers	✓	✓	
Color printers	✓	✓	
Slide makers	✓		
File output:			
HP-GL format	✓	✓	
PIC format		✓	
Data import:			
ASCII files	✓	✓	✓
Worksheet files		✓	
DIF files	✓		
Binary files		✓	
Graph formats:			
Bar graphs	✓		✓
Line and scatter graphs	✓	✓	✓
Polar plots		✓	
Merged graphs	✓	✓	✓
Multiple X and Y axes	✓	✓	✓
Miscellaneous:			
Control pen speed	✓		✓
Gaps in axes/plot lines			✓
Y error bars	✓	✓	✓
X error bars	✓	✓	
Automatic data legends	✓		✓
Pointing device support	✓		
Digitize data			✓
Greek symbols	✓	✓	✓
Super/subscripts in label	✓	✓	✓
Data transformation†	✓	✓	✓
Curve fitting†	✓	✓	✓
Data smoothing†	✓	✓	✓

† These features are implemented differently in each product

Tektronix 4695 color printer, *Sigma-Plot* worked fine with it in my tests. In addition to serial HP-GL–compatible plotters, *Tech*Graph*Pad* can print graphs on the HP LaserJet II, the HP DeskJet Professional, and the HP PaintJet color printers. *GraphPad* limits itself to plotters that are compatible with the HP-GL.

All three programs can produce color output. *GraphPad* lets you specify which pens the program should use for which colors and lets you change pens manually during the plotting process. This gives you a virtually unlimited selection of colors. *Sigma-Plot* lets you specify up to 16 colors in your graph, while *Tech*Graph*Pad* lets you specify up to 8. When sending output to a plotter, any of these programs will automatically select the proper pen if it's available or prompt for manual pen changes if it isn't.

GRAPHPAD LETS YOU DIGITIZE DATA DIRECTLY FROM PRINTED GRAPHS.

When you plot on overhead transparencies, you must use a slower speed than when you plot on paper, or the ink may smear. *Sigma-Plot* and *GraphPad* permit you to control pen speed; *Tech*Graph*Pad* does not. However, according to *Tech*Graph*Pad*'s publisher, version 3.1, due out by the time you read this, will permit you to control pen speed.

DATA IMPORT AND EXPORT

Desktop-publishing programs and some word processors let you incorporate graphics into documents if the image resides in a compatible file format. Two widely used formats are HP-GL, which consists of the plotter commands that can produce the graph on an HP-GL–compatible plotter, and Lotus's PIC graph-file format. *Tech*Graph*Pad* can produce either file format; *Sigma-Plot*, only HP-GL files; *GraphPad*, neither.

All three programs can use data entered from the keyboard or imported from ASCII files. *Tech*Graph*Pad* also lets you browse through *1-2-3*, *Symphony*, *Quattro*, or *VP-Planner* worksheet files on your screen. You can specify what you want to import either by entering a range name or by using the cursor to highlight a range. In *Tech*Graph*Pad* you can also import data files created by *LabTech Notebook*, a laboratory data acquisition and control program from Laboratory Technologies Corp. (Wilmington, Mass.), and binary data files created by certain data-acquisition boards made by Data Translation and MetraByte. In addition to importing data from ASCII files, *Sigma-Plot* can import from DIF files.

Although *GraphPad* can read only ASCII files, it does let you digitize data directly from printed graphs. If you place a printed graph in the plotter and manually trace the graph with the plotter's pen, *GraphPad* can convert the points into values and use them as the basis for a graph. You have the option of digitizing bar graphs, curves, or individual data points. Although *GraphPad* can plot with HP-GL–compatible plotters, the program doesn't necessarily digitize input from all of them. If you're interested in digitizing existing graphs, check with the publisher for a list of compatible plotters. ■

IN BRIEF

GraphPad Version 2.0. ISI Software, Institute for Scientific Information, 3501 Market St., Philadelphia, PA 19104; 215-386-0100, ext. 1418. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers with dual floppy-disk drives or one floppy disk and a hard disk. Requires 512K of RAM and a graphics card (CGA, EGA, or Hercules). Released 9/87. $249. Not copy-protected; 90-day defective-disk warranty.

Sigma-Plot Version 3.10. Jandel Scientific, 65 Koch Rd., Corte Madera, CA 94925; 415-924-8640. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers with dual floppy-disk drives or one floppy disk and a hard disk. Requires 640K of RAM and a graphics card (CGA, EGA, VGA, or Hercules). Released 9/87. $395. Not copy-protected; one-year defective disk warranty.

*Tech*Graph*Pad* Version 3.0. Binary Engineering, 400 Fifth Ave., Waltham, MA 02154; 617-890-1812. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers with dual floppy-disk drives or one floppy disk and a hard disk. Requires 512K of RAM and a graphics card (CGA, EGA, VGA, or Hercules). Released 7/88. $395. Not copy-protected; 30-day, money-back guarantee; 90-day defective-disk warranty.

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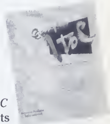

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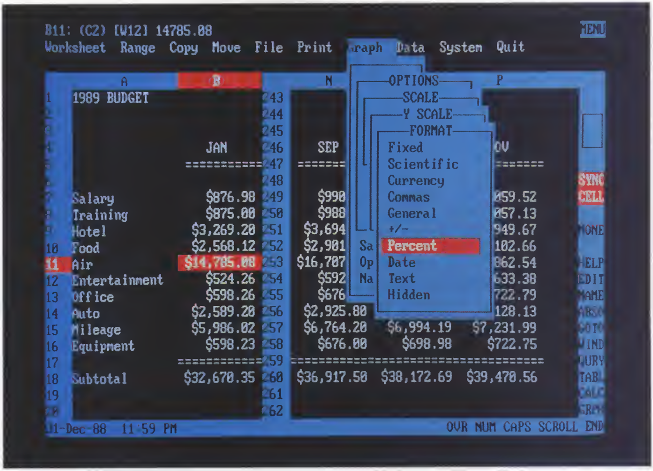

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    Salary           $876.98 49     $990      Commas       059.52    CELL
    Training         $875.00 50     $988      General      057.13
    Hotel          $3,269.20 51   $3,694      +/-          949.67    ONE
10  Food           $2,568.12 52   $2,901  Sa  Percent      102.66
11  Air           $14,785.08 53  $16,707  Op  Date         862.54    ELP
12  Entertainment    $524.26 54     $592  Na  Text         633.38    EDIT
13  Office           $598.26 55     $676      Hidden       722.79    AME
14  Auto           $2,589.20 56   $2,925.80                128.13
15  Mileage        $5,986.02 57   $6,764.20   $6,994.19  $7,231.99
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LOTUS SPECIAL-INTEREST & USER GROUPS

These groups are open to both beginning and expert users of Lotus products. Meetings combine question-and-answer sessions and presentations. Many of the groups listed here publish monthly newsletters and distribute public domain library disks. All phone numbers are daytime numbers unless otherwise noted. (This list does not include corporate user groups.)

Alabama

Birmingham IBM PC User Group
Contact Martin Schulman, 205-967-5883.

Arizona

Lotus 1-2-3 SIG of the Tucson Computer Society
Contact Tom Kelley, 602-885-6113 (days and evenings), or Dennis Viehland, 602-325-0004 (evenings).

Phoenix Lotus User Group (PLUG)
Contact Gaynard Nelson, 602-274-2461.

California

Fremont Lotus Symphony/1-2-3 User Group
Contact Veronica Finch, 415-794-2128 or 415-846-0932 (evenings).

Fresno IBM PC User Club
Contact Michael Dowdy, 209-439-6040, or Tom Borchardt, 209-432-2045.

Los Angeles Lotus User Group
Meets in Burbank. Contact Don Roark, 818-905-1441.

Lotus SIG of Modesto PC User Group
Meets in various locations in Modesto area. Contact Loyd Reedy, 209-599-6486 (days and evenings).

Lotus SIG of North Orange County Computer Club
Meets in Orange. For information, call hotline, 714-998-8080.

Lotus SIG of Sacramento PC User Group
Contact John Skelly, 916-448-1501 or 916-421-0871 (evenings).

Lotus 1-2-3/Symphony SIG of Silicon Valley Computer Society
Meets in Milpitas. Contact William Welch, 408-247-3405 (evenings) or 408-732-0880, ext. 442.

Lotus SIG of the San Diego Computer Society Disabled Interest Group
Contact Milton Blackstone, 1301 Dellcrest Lane, La Jolla, CA 92037.

Lotus SIG of the San Francisco PC User Group
Call 415-621-2609 (electronic bulletin board), or Jerry Stern, 415-282-4100.

Orange Coast IBM PC User Group (OCIPUG)
Contact John Alesi, 714-770-1130.

Pasadena IBM User Group
Contact Steve Bass, 818-795-2300.

Colorado

The Spreadsheet Group
Meets in Denver. Contact Jack McKinley, 303-733-1277 (days and evenings).

Connecticut

Lotus SIG of the Spreadsheet Integrated Software Group
Meets in Darien. Contact Bob Cole, 203-866-7307 (days and evenings).

Tax Executive Institute Computer User Group—Connecticut Valley/Westchester and Fairfield Counties Chapter
Meets in various locations. Contact Allen Finkenaur, 203-579-8028.

Delaware

Lotus SIG of PC Professional User Group
Meets in Wilmington. Contact Bob Klahn, 302-774-3764.

Florida

Boca Raton PC User Group
Contact Rich Sandell, 305-278-6959 (evenings).

Lotus SIG of Jacksonville: {LOTUS}
Contact Don McLeish, 904-390-7958 or 904-743-8366 (evenings).

Miami PC User Group
Contact Jeff Feinberg, 305-962-8889, 305-948-6332, or 305-946-7666 (Boca Raton).

Pinellas IBM PC User Group
Meets in Pinellas Park (Saint Petersburg area). Contact Dick Kellerman, 813-526-5258 (days and evenings), or John Ward, 813-447-7681.

Georgia

Atlanta Lotus User Group
Meets in Roswell. Contact Kevin Berez, 404-924-1490 or 404-924-1155 (evenings).

Hawaii

Island Lotus Group
Meets at various locations. Contact Lionel Aller, P.O. Box 8615, Honolulu, HI 96830-0615, or call 808-955-4395 (evenings).

Illinois

Central Illinois Lotus User Group
Meets in Decatur. Contact Gary Secor, 217-424-6693 or 217-429-1813.

Lotus SIG of Chicago Computer Society
Meets in Des Plaines. Contact Bob Dix, 312-991-8888.

Indiana

Federal Home Loan Bank PC User Group—Indiana Chapter
Meets in Indianapolis. Contact Ron Malone, 317-236-7182.

Lafayette Lotus User Group
Contact William Bonsignore, 317-742-1244.

Lotus SIG of Northeast Indiana PC User Group
Meets in Fort Wayne. Contact George Gynn, 219-693-6372 (days and eve-

nings), or 219-693-6126 (bulletin board).

Lotus SIG of Terre Haute PC User Group
Contact Dr. William Osmon, 812-237-2372 or 812-877-3244 (evenings).

Lotus SIG of the Indianapolis Computer Society
Contact Tony Moleta, 317-862-5963 (evenings).

Iowa
Hawkeye PC User Group
Meets alternately in Cedar Rapids and Iowa City. Contact James Poynter, 319-393-0594 (days and evenings).

Lotus SIG of the Quad City IBM PC User Group
Meets in Davenport. Contact Bill Burrows, 309-949-2430 (days and evenings).

Kansas
Lotus After Hours
Meets in Wichita. Contact Rex Cornelius, 316-262-0611.

Kentucky
Kentucky–Indiana Personal Computer User Group (KIPCUG)
Contact Ricardo Dobson, 502-423-8629 (evenings).

Louisiana
Lotus SIG of New Orleans PC User Group
Meets in Metairie. Contact Harris Segal, 504-834-4964.

Lotus Users of South Louisiana
Meets in Lafayette. Contact Harvey Broussard Jr., 318-365-8754 (days and evenings).

Maryland
Lotus SIG of the Capital PC User Group
Meets in Rockville and Bethesda. Call 301-762-6775, or contact Roy Rosfeld, 301-340-7962 (days and evenings).

Massachusetts
Boston Computer Society/ Lotus User Group
Meets at various locations. Call 617-227-0170 (hotline), 617-367-8080, or 617-367-6751.

Michigan
Federal Home Loan Bank PC User Group—Michigan Chapter
Meets in Lansing. Contact Ron Malone, 317-236-7182.

Lotus SIG of the Saginaw Valley Computer Association
Meets in Saginaw. Contact Lynn Kauer, 517-496-2440.

Mac-In-Awe Macintosh User Group
Meets in Midland. Contact Sheldon Levy, 517-636-0009.

Softalk Farmers
Meets in Caro. Contact Dennis Stein, 517-893-3523 or 517-893-3443 (evenings).

Southeastern Michigan Computer Organization (SEMCO)— Lotus User SIG
Meets in Southfield. Write to P.O. Box 02426, Detroit, MI 48202, or call 313-284-2816 (electronic bulletin board).

Symphony User Group
Meets in Mount Pleasant. Contact Chris Crawford, 517-774-7189.

Minnesota
TC/PC Spreadsheet Special Interest Group
Meets in Wayzata. Contact Dr. Kamal Sahgal, 612-937-9231 (evenings).

Twin Cities Lotus User Group (TC LUG)
Meets in Minneapolis. Contact Bob O'Connor, 612-559-2516 (days and evenings).

Missouri
Kansas City Lotus User Group
Contact Linda Combs, 816-924-3772 (afternoons and evenings).

Lotus SIG of the St. Louis User Group for the IBM PC
Contact Riley O. Bowlin III, 314-235-8058.

Montana
Billings Lotus User Group
Contact John Lowry, Ph.D., 406-652-3351.

Nebraska
Omaha Computer Society Lotus User Group
Contact John Bettini, 402-334-2308, or call 402-334-2310 (bulletin board).

START A LOTUS USER GROUP

If there is no Lotus User Group in your company or community, consider starting one yourself. For a User Group Starter Kit, write to the Sales Planning Dept., User Group Office, Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142. Include your name, work or home address, telephone number, and the type of group you wish to start (company-based or independent).

Nevada
Lotus SIG of Las Vegas— PC User Group
Contact Sandy Frunzi, 702-734-6193.

New Jersey
Lotus SIG of Garden State Business User Group
Meets in Clifton. Contact Alan Bronner or Ron Rice, 201-934-1887.

New Jersey PC User Group
Meets in Lyndhurst. Contact Neil Stewart, 201-664-3311.

PC User Group—Amateur Computer Group of New Jersey
Meets in Scotch Plains. Contact Dave Wrobel, 201-264-8242 (evenings).

Tax Executives Institute Computer User Group—New Jersey Chapter
Meets in various locations. Contact Al Fink, 201-527-7211.

New Mexico
Albuquerque Lotus User Group
Contact Peter Starr, 505-764-9451 (evenings).

New York
Administrative Microcomputer Advisory Council
Meets in New Paltz. Contact Stacey Ross, 914-255-1450, ext. 68.

Long Island Lotus User Group
Meets at various locations. Contact Lloyd Wilson, 516-248-1533 (days and evenings).

NYPC Power User SIG
Contact NYPC, 212-533-6972 (bulletin board).

NY Symphony SIG
Meets in Manhattan. Contact John James, 212-374-6289 or 718-441-0258 (evenings).

PC^3
Meets in Rochester. Contact Malcolm R. Brown, 716-272-0230.

North Carolina
Asheville IBM PC User Group
Contact Jeffrey Bowen, 704-693-4907 or 704-697-6834 (evenings).

Tax Executives Institute Computer User Group—Carolina Chapter
Meets at various locations in Research Triangle Park area. Contact Don Ardis, 919-379-4569.

Ohio
Lake Ashtabula IBM PC User Group
Meets in Madison. Contact Steve Adams, 216-943-4200 or 216-352-6397 (evenings).

Lotus SIG at Miami University
Meets in Oxford. Contact Ralph Gutowski, 513-529-4228.

Spreadsheet SIG of Greater Cincinnati IBM PC User Group
Meets in Springdale. Contact Jan Koenig, 513-742-2160.

Spreadsheet User Group of the Columbus Computer Society
Meets in Columbus. Contact John Finsel, 614-743-2682 (days and evenings), or Dave Sherman, 614-294-0671 (days and evenings).

Oklahoma
Oklahoma Lotus User Group (OK LUG)
Meets in Oklahoma City. Contact Wayne Buswell, 405-525-4413 or 405-842-6491 (evenings).

Oregon
Lotus SIG of Salem Area Computer Club
Meets in Salem. Contact T. J. Schaffer, 503-753-5430 (days and evenings).

Pennsylvania
Professional PC User Group of Pittsburgh
Contact Mark Frederickson, 412-234-1432.

Spreadsheet SIG of the Philadelphia Area Computer Society (PACS)
Meets in Philadelphia. Contact Dave Smith, 215-876-2930.

Spreadsheet Solutions SIG of the Philadelphia Area Computer Society (PACS)
Meets in Philadelphia. Contact Jeff Pilant, 215-672-8673.

Susquehanna Lotus User Group—Central Pennsylvania Chapter
Meets in Camp Hill. Contact Bruce Bechtold, 717-921-8151 or 717-921-8031 (evenings).

South Carolina
Lotus SIG of the Charleston Computer Club
Contact Rick Klein, 803-763-7675 (evenings).

Lotus SIG of the Palmetto Personal Computer Club
Meets in Columbia. Contact Don Wical, 803-798-6020.

Tennessee
Lotus SIG of Music City IBM PC User Group
Meets in Nashville. Contact Jeff Ridings, 615-377-7651 or 615-868-9283 (evenings).

Texas
Coastal Area User Group
Meets in Corpus Christi. Contact John Clements, 512-993-2230 (evenings).

Houston Lotus 1-2-3/Symphony SIG of the Houston Area League of PC Users (HAL PC)
Contact Betty Brooks, 713-493-4719 (days and evenings).

HUD Fort Worth Micro User Group
Contact Jim Doyle, 817-885-5642.

Lotus Orchestration User Group
Meets in Texarkana. Contact Chuck Sears, 214-793-0315.

Lotus SIG of 1960 PC User Group
Meets in Houston. Contact Bob Arrington, 713-444-1511, or Jim Temmen, 713-288-7580.

Lotus SIG of Alamo PC Organization
Meets in San Antonio. Call 512-231-8497 for recorded information, or contact Glynn Barclay, 512-656-9080.

Lotus SIG of Central Texas PC User Group
Meets in Austin. Contact Sam Amsler, 512-836-7673, or Centex User Group Information, 512-837-4636.

Lotus SIG of North Texas PC User Group
Meets in Dallas. Contact Mark Gruner, 214-964-8174 (evenings).

Northeast Tarrant Lotus User Group
Meets in Fort Worth. Contact Jack Griffith, 817-795-3742 (days and evenings).

Southwest International Personal Computer Club
Meets in El Paso. Contact George Ybarra, 915-566-6961 (evenings), Paul Apodaca, 915-598-6424 (evenings), or bulletin board, 915-534-8507.

Virginia
Tax Executives Institute Computer User Group—Virginia Chapter
Meets in Richmond. Contact Pete Birch, 804-281-2667 or 804-272-8687 (evenings).

Washington
Borderline PCUG/Lotus SIG
Meets in Bellingham. Contact Clarence Monteiro, 206-671-1450, or Gary Rohrbaugh, 206-676-0999.

Tax Executive Institute Computer User Group—Seattle Chapter
Contact Bill Fisher, 206-345-5580.

West Virginia
Lotus SIG of Morgantown IBM PC User Group
Contact Tom Witt, 304-293-5837.

Lotus SIG of the Huntington User Group (PC-HUG)
Contact Levi Lauvray, 304-526-5189, or Marshall University's Computer and Information Science Dept., 304-696-5424.

Wisconsin
Milwaukee IBM PC User Group
Meets in Brookfield. Call 414-679-9075 for recorded information.

Spreadsheet SIG of the Madison IBM PC User Group
Contact Tom Yost, 608-222-8445 (evenings).

British Columbia, Canada
Big Blue and Cousins
Meets in Victoria. Call 604-382-3934 for recorded information.

Lotus SIG of Certified General Accountants Association of British Columbia
Meets in Vancouver. Contact Michael Connelly, 604-420-4449.

New Brunswick, Canada
New Brunswick Lotus User Group (@NB[LUG])
Meets at various locations. Contact Dino Kubik, 506-452-8100.

ON-LINE MEETINGS

In addition to the groups listed here, there are on-line meetings for users of Lotus software. One such meeting place, the World of Lotus, is on CompuServe, the electronic information service. Sponsored by Lotus Development Corp., it contains two electronic bulletin boards (the Lotus Integrated Products Forum and the Lotus Standalone Products Forum) plus extensive reference libraries containing instructional text, worksheet applications, add-ins, and more. Users pay regular CompuServe time charges. To get to the World of Lotus, enter *go lotus* when you see the CompuServe exclamation point prompt (!). ■

WRITE US

Does your user group or SIG belong on this list? If a primary activity of your group is supporting Lotus products, let us know about your group. Write to: User Group Listings, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.*

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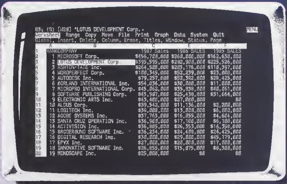
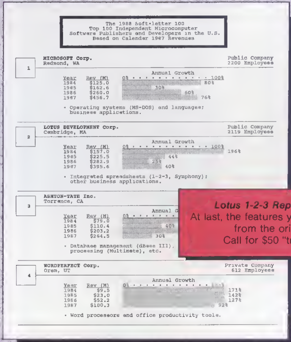


```
B3: (G) [W20] 'LOTUS DEVELOPMENT Corp.                                    MENU
Worksheet  Range  Copy  Move  File  Print  Graph  Data  System  Quit
Global, Insert, Delete, Column, Erase, Titles, Window, Status, Page
     A        B                           C             E             F
1   RANKCOMPANY                      1987 Sales    1986 SALES    1985 SALES
2     1 MICROSOFT Corp.            $456,700,000  $260,000,000  $162,630,000
3     2 LOTUS DEVELOPMENT Corp.    $395,595,000  $282,900,000  $225,526,000
4     3 ASHTON-TATE Inc.           $264,500,000  $203,176,000  $110,397,000
5     4 WORDPERFECT Corp.          $100,345,000   $52,239,000   $23,000,000
6     5 AUTODESK Inc.               $79,257,000   $52,382,000   $28,425,000
7     6 BORLAND INTERNATIONAL Inc.  $54,036,000   $30,000,000   $11,000,000
8     7 MICROPRO INTERNATIONAL Corp. $45,062,000  $35,858,000   $40,061,000
9     8 SOFTWARE PUBLISHING Corp.   $43,907,000   $25,438,000   $31,664,000
10    9 ELECTRONIC ARTS Inc.        $43,400,000   $27,000,000            $0
11   10 ALDUS Corp.                 $39,542,000   $11,136,000    $2,200,000
12   11 LOGITECH Inc.               $38,000,000   $13,000,000    $6,000,000
13   12 ADOBE SYSTEMS Inc.          $37,763,000   $16,055,000    $4,604,000
14   13 SANTA CRUZ OPERATION Inc.   $36,900,000   $17,100,000    $6,100,000
15   14 ACTIVISION Inc.             $36,805,000   $26,353,000   $16,358,000
16   15 BRODERBUND SOFTWARE Inc.    $36,234,000   $24,408,000   $24,425,000
17   16 DIGITAL RESEARCH Inc.       $30,000,000   $29,000,000   $45,179,000
18   17 EPYX Inc.                   $27,000,000   $20,000,000   $17,000,000
19   18 INNOVATIVE SOFTWARE Inc.    $26,855,000   $15,075,000    $8,300,000
20   19 MINDSCAPE Inc.              $25,000,000            $0            $0
```

A Lotus database is a range or an entire worksheet having field names in the first row and records of data in rows below.



```
              The 1988 Soft·letter 100
         Top 100 Independent Microcomputer
   Software Publishers and Developers in the U.S.
           Based on Calendar 1987 Revenues

 1   MICROSOFT Corp.                               Public Company
     Redmond, WA                                   2200 Employees
                                 Annual Growth
         Year   Rev (M)     0% . . . . . . . . . . . . 100%
         1984   $125.0                             80%
         1985   $162.6             30%
         1986   $260.0                       60%
         1987   $456.7                          76%

         · Operating systems (MS-DOS) and languages;
           business applications.

 2   LOTUS DEVELOPMENT Corp.                       Public Company
     Cambridge, MA                                 2119 Employees
                                 Annual Growth
         Year   Rev (M)     0% . . . . . . . . . . . . 100%
         1984   $157.0                                   196%
         1985   $225.5               44%
         1986   $282.9             25%
         1987   $395.6              40%

         · Integrated spreadsheets (1-2-3, Symphony);
           other business applications.

 3   ASHTON-TATE Inc.
     Torrance, CA
                                 Annual G
         Year   Rev (M)     0% . . . . . .
         1984    $79.0
         1985   $110.4               40%
         1986   $203.2
         1987   $264.5             30%

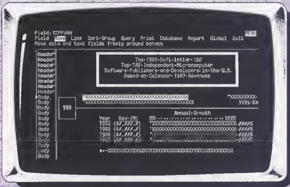
         · Database management (dBase III),
           processing (Multimate), etc.

 4   WORDPERFECT Corp.                             Private Company
     Orem, UT                                      612 Employees
                                 Annual Growth
         Year   Rev (M)     0 . . . . . . . . . . . .
         1984     $9.5                                   171%
         1985    $23.0                                   142%
         1986    $52.2                                   127%
         1987   $100.3                                92%

         · Word processors and office productivity tools.
```

Lotus 1-2-3 Report Writer™ Users:
At last, the features you've been waiting for,
from the original authors.
Call for $50 "trade-up" details.

A report is any printout or screen display of data from your database. Anything beyond simple listings of data requires complex macros, or can't be done with Lotus.



```
Field: COMPANY                                                          MENU
Field  Move  Line  Sort-Group  Query  Print  Database  Report  Global  Exit
Move data and text fields freely around screen
 Header
 Header                  The·1988·Soft·letter·100
 Header            Top·100·Independent·Microcomputer
 Header      Software·Publishers·and·Developers·in·the·U.S.
 Header             Based·on·Calendar·1987·Revenues
 Header
 Header
 Header
>Body.        XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX             "XXXXXXXXX·
 Body    999  'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX               9999·Em
 Body
 Body                              Annual·Growth
 Body          Year    Rev·(M)   0%·.................100%
 Body          1984 ($#,###.#)   'XXXXXXXXXXXXXXXXXXXXXXXXXXX·####%
 Body          1985 ($#,###.#)   'XXXXXXXXXXXXXXXXXXXXXXXXXXX·####%
 Body          1986 ($#,###.#)   'XXXXXXXXXXXXXXXXXXXXXXXXXXX·####%
 Body          1987 ($#,###.#)   'XXXXXXXXXXXXXXXXXXXXXXXXXXX·####%
 Body
 Body          ▪·-XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 Body
```

A report writer is a tool that lets you specify what data to select, what additional calculations to perform, where to place everything, and exactly how it should look.

Trademarks: Lotus, 1-2-3, Symphony, Lotus Report Writer by Lotus Development Corporation; IBM by International Business Machines Corporation; dBASE by Ashton-Tate; R&R Relational Report Writer and R&R Worksheet Report Writer by Concentric Data Systems, Inc.

NEW PRODUCTS

Allways, the Spreadsheet Publisher, Creates Presentation-Quality Reports

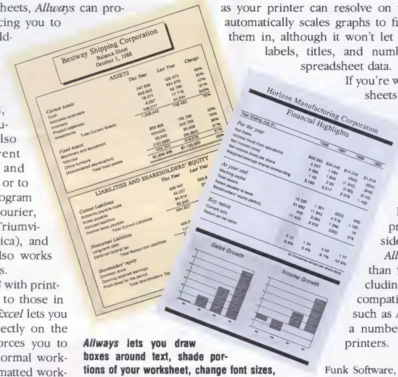
IF YOU WANT PRESENTATION-QUALITY REPORTS from your *1-2-3* worksheets, *Allways* can provide them without forcing you to leave *1-2-3*. With this add-in for *1-2-3* Release 2/2.01, you can highlight your data with background shading, borders, boxes, lines, grids, and single or double underlining. It also lets you apply different type styles, weights, and sizes to individual cells or to entire ranges. The program includes five fonts: Courier, Times, Times Italic, Triumvirate (similar to Helvetica), and Triumvirate Italic. It also works with your printer's fonts.

Allways endows *1-2-3* with printing capabilities similar to those in *Microsoft Excel*. While *Excel* lets you stylize your output directly on the spreadsheet, *Allways* forces you to switch between your normal worksheet display and a formatted worksheet display produced by *Allways*. Once you switch your display to the formatted worksheet, you can design right on the screen and immediately see what your printout will look like. You must, however, change back to normal display to use *1-2-3* commands or enter data.

Allways has an advantage over *Excel* in that, unlike *Excel*, it can print graphics on the same page with text. *Allways* can embed as many *1-2-3* graphics in your printed worksheets as your printer can resolve on the page. The program automatically scales graphs to fit the range you embed them in, although it won't let you format the graph's labels, titles, and numbers as you can your spreadsheet data.

If you're working with wide worksheets, the vertical and horizontal page breaks that show on the formatted screen make it simple to lay out your worksheet to your best advantage. Unlike *Sideways*, however, *Allways* can't print more than one page sideways.

Allways works with more than 50 popular printers, including the HP LaserJet and compatibles, PostScript printers such as Apple's LaserWriter, and a number of leading dot-matrix printers. *—Bruce Brown*


Bestway Shipping Corporation
Balance Sheet
October 1, 1988
ASSETS
LIABILITIES AND SHAREHOLDERS' EQUITY
Horizon Manufacturing Corporation
Financial Highlights
Sales Growth
Income Growth

***Allways* lets you draw boxes around text, shade portions of your worksheet, change font sizes, and place graphs on the same page as worksheet data.**

Funk Software, 222 Third St., Cambridge, MA 02142; 617-497-6339. Requires *1-2-3* Release 2/2.01 and runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers with PC/MS DOS 2.0 or higher. Works with CGA, EGA, VGA, and Hercules display adapters, most standard printer drivers, and PostScript printers. Requires approximately 100K of RAM above that used by *1-2-3* when in conventional memory. $149.95. For an indefinite time, free with purchase of *1-2-3* Release 2.01. Released 10/88. Unconditional 30-day, money-back guarantee when purchased through Funk Software.

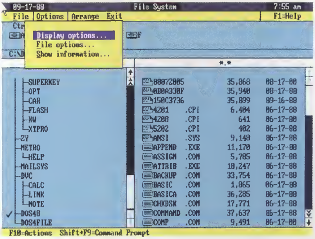
CIRCLE 1 ON READER SERVICE CARD

Information for New Products is supplied by the vendors and was up to date as of 10/11/88. Since production specifications change frequently, we recommend that you verify this information with a dealer before making a purchase.

SOURCE: FUNK SOFTWARE

IBM's DOS 4: Incompatibilities Mar Increased Functionality, Ease of Use

OF THE MORE THAN 30 NEW OR ENHANCED FEATURES of DOS 4.0, the most significant is an optional user interface that lets you use pull-down menus to select most DOS commands. Known as a shell, the new interface isn't as fully featured as existing aftermarket shells such as the *Norton Commander* or *XTree* (Executive Systems Inc., Sherman Oaks, Calif.). Nonetheless, it can spare you the tedious typing and syntactical errors that necessarily accompany working from the DOS prompt. With those difficulties out of the way, you might find yourself using DOS features you were discouraged from learning before.



```
  │ ├─SUPERKEY
  │ ├─OPT
  │ ├─CAR
  │ ├─FLASH
  │ ├─KW
  │ └─XTPRO
  ├─ZY
  ├─METRO
  │ └─HELP
  ├─MAILSYS
  ├─DVC
  │ ├─CALC
  │ ├─LINK
  │ └─NOTE
✓ ├─DOS40
  └─DOS4FILE
```

```
08072005            35,868  08-17-88
0B0A330F            35,940  08-17-88
150C3736            35,899  09-16-88
4201     .CPI        6,404  06-17-88
4208     .CPI          641  06-17-88
5202     .CPI          402  06-17-88
ANSI     .SYS        9,148  06-17-88
APPEND   .EXE       11,170  06-17-88
ASSIGN   .COM        5,785  06-17-88
ATTRIB   .EXE       18,247  06-17-88
BACKUP   .COM       33,754  06-17-88
BASIC    .COM        1,865  06-17-88
BASICA   .COM       36,285  06-17-88
CHKDSK   .COM       17,771  06-17-88
COMMAND  .COM       37,637  06-17-88
COMP     .COM        9,491  06-17-88
```

DOS 4's new features include a DOS shell that makes DOS commands easier for a novice to learn and for anyone to use. Unfortunately, the new DOS suffers from incompatibilities with some hardware and software that work well in DOS 3.3. Until the compatibility problems are solved, approach the new DOS with care.

The new version's most disturbing problem is its occasional lapses in compatibility with previous versions. While running DOS 4.0 and *Desqview* (Quarterdeck Office Systems, Santa Monica, Calif.), my computer crashed several times, and it crashed every time I tried to use an Iomega Bernoulli Box. Reports have surfaced elsewhere of similar problems between DOS 4.0 and *Paradox 386* (Borland International, Scotts Valley, Calif.) and non-IBM expanded-memory boards.

A spokesperson for IBM wouldn't comment directly on those incompatibilities, saying instead that "DOS 4.0 is an upwardly compatible enhancement to DOS 3.3." But a subsequent remark by that spokesperson may be more telling: "Some vendors are modifying their software products to work with 4.0."

If you're considering upgrading to DOS 4.0, check with your vendor first, particularly if that vendor's product uses expanded memory. A Lotus Development Corp. spokesperson said that *1-2-3* and *Symphony* run just fine with DOS 4.0. If you have anything but IBM hardware, check it as well.

One reason for possible incompatibilities between DOS 4.0 and products that use expanded memory is that DOS 4.0 can itself use expanded memory for some of its operations. That means more conventional memory should be available for your applications. In the case of *1-2-3*, your worksheets should benefit because *1-2-3* can better use conventional memory than it can expanded memory. However, if you don't have expanded memory and you work with large worksheets, you may not want DOS 4.0 because it uses 10K more memory than does DOS 3.3.

Subsequent to the release of DOS 4.0, IBM released DOS 4.01, which incorporates "engineering changes," but those changes do not affect the program's expanded-memory capabilities. Microsoft Corp., which will provide a version of the new DOS for resale by computer manufacturers, claims to be unaware of any problems in the new DOS release, although it admits that incompatibilities are "always a possibility." Microsoft, however, says that it is "prepared to address any problems that show up."

DOS 4 removes the 32-megabyte limit to a hard-disk partition. If your hard disk is larger than that and you want just one partition, you can have it without using aftermarket DOS patches.

—*Marc Davidson*

IBM (dial 800-447-4700 for your nearest IBM marketing representative or dealer). Runs on the IBM PS/2, PC AT, PC XT, XT 286, PC, or PC Convertible computers with 256K of RAM and a 3½-inch or 5¼-inch floppy-disk drive. DOS 4.0 is available in both media. $150; $95 for upgrade until April 28, 1989, for registered users of any previous DOS version. 90-day warranty on media; one-year warranty on program defects.

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46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
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Fair	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Poor	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N/A	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

TELL US HOW WE DID

The editors of *LOTUS* would appreciate your evaluation of the articles in this issue. This is easier than it may appear.

1 Get the assigned number for each article from the Editorial Evaluation list on the facing page.

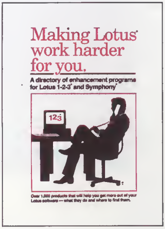
2 Find the article's number in the top row of the evaluation section of the card.

3 Circle the number that reflects your evaluation. If an article did not interest you at all, circle number 5 in the N/A row.

We encourage you to comment on, as well as evaluate, the contents of this issue. Thanks in advance.

NEW PRODUCTS

Book Lists Over 1,000 Software Packages Related to 1-2-3 and Symphony


Making Lotus work harder for you.
A directory of enhancement programs for Lotus 1-2-3 and Symphony
123
Over 1,000 products that will help you get more out of your Lotus software — what they do and where to find them.

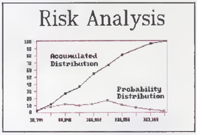
MAKING LOTUS WORK HARDER FOR YOU, a directory of enhancement programs for *1-2-3* and *Symphony*, lists 1,012 software products from 476 vendors. In addition to providing the product name, vendor name, address, and telephone number, the book describes each product and indicates which release of *1-2-3* or *Symphony* it requires. Sixty-eight product categories are listed by vertical markets, such as restaurants and publishing, or by function, such as memory management and learning aids.

The 288-page book, published in November, costs $19.95 in paperback. It's from Vericomp Publishing, P.O. Box 55238, Grand Junction, CO 81505; 800-234-1140.

CIRCLE 3 ON READER SERVICE CARD

1-2-3/Symphony Add-in Includes Six Decision-Support Products

BUSINESS PLANNER contains goal-seeking, budgeting, scenario-analysis, risk-analysis, forecasting, and linear-optimization add-in programs. Each program is self-contained. You can use any one for decision analysis without having to alter your worksheet.



Business Planner uses 115K of RAM. It requires *1-2-3* Release 2 or 2.01 or any release of *Symphony*, and runs on the IBM PC, PS/2, and compatible computers. The add-in costs $295, from Enfin Software Corp., 6920 Miramar Rd., Suite 106A, San Diego, CA 92121; 800-922-4372, in Calif. 800-722-4372.

CIRCLE 4 ON READER SERVICE CARD

EDITORIAL EVALUATION

Your comments about *LOTUS* magazine help us bring you the best editorial product each month. To rate the articles in this issue, scan the list below and refer to the EDITORIAL EVALUATION card on the bottom of the insert to the left. Identify the number corresponding to each article, then circle the number on the card that reflects your rating.

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AND COMING NEXT MONTH:

- **■ *LOTUS* Annual Index**
- **■ Public Domain Software**
- **■ Advanced Formula Techniques**
- **■ Macros: Beyond the Worksheet**

Add-on Software Lets You Use a Mouse with 1-2-3

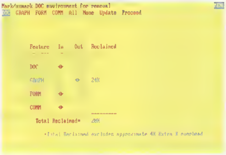
MARQNAVIGATOR FOR 1-2-3 is a graphical interface that lets you maneuver around your spreadsheet with a mouse. The program provides windowed menus and submenus for easy status reference. Using the mouse, you can accelerate to any edge or corner of the spreadsheet or pull open and move windows.

MarqNavigator uses 35K of RAM and requires *1-2-3* Release 2/2.01 and a Microsoft, Logitech, or compatible mouse. It costs $149, from Marq Technologies, 6285 Nancy Ridge Dr., San Diego, CA 92121; 800-336-8366.

CIRCLE 5 ON READER SERVICE CARD

Symphony Add-in Expands RAM Available in SHEET Environment

EXTRA K allows you to reclaim for the SHEET environment 78K to 93K of the memory normally used by the other *Symphony* work environments. You can remove and reinstate any combination of FORM, DOC, GRAPH, and COMM environments. The program won't conflict with other add-ins except those requiring an environment you've removed from memory.



```
Mark/unmark DOC environment for removal                              MENU
DOC  GRAPH  FORM  COMM  All  None  Update  Proceed



      Feature   In    Out   Reclaimed

      DOC       ◆

      GRAPH           ◆     24K

      FORM      ◆

      COMM      ◆
                            ---------
        Total Reclaimed*    28K

           *Total Reclaimed excludes approximate 4K Extra K overhead
```

Extra K uses 6K of RAM, requires *Symphony* Release 1.1, 1.2, or 2.0, and runs on the IBM PC, PS/2, and compatible computers. It costs $79.95, from Lerman Assoc., 12 Endmoor Rd., Westford, MA 01886; 508-692-7600.

CIRCLE 6 ON READER SERVICE CARD

Add-in Gives You Four Ways to Get Data from a Hewlett-Packard 3000 into 1-2-3

OMNIVIEW lets you work in *1-2-3* to import whole HP 3000 records with any number of fields, retrieve a group of records with their linked data sets, manipulate data on the HP and download the answer, and format a worksheet to fill a table from an HP database. It includes 15 database-management @functions.

Omniview requires *1-2-3* Release 2/2.01 and runs on the IBM PC, PS/2, and compatible computers with 640K of RAM and a hard disk. It also runs on any HP 3000 computer using an *Image* database. The add-in costs $4,500 to $11,000, depending on the HP model, from Disc, 910 Fifteenth St., Denver, CO 80202; 303-893-0335.

CIRCLE 7 ON READER SERVICE CARD

Sheetmate Update Sends Hewlett-Packard 3000 Printer Reports into 1-2-3

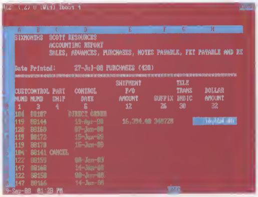
SHEETMATE Version 3.1 lets you take HP 3000 printer reports out of the queue and put them into any WK1, WKS, or delimited ASCII file so that you don't have to rekey them. The software automatically formats the spreadsheet to duplicate the report's column widths, negative numbers, headings, integers, decimals, and currency. You can select which pages of the reports you want, such as just those with totals.

Sheetmate runs with *1-2-3* Release 1A and 2.01 and any HP 3000. It costs $1,250 to $3,000, depending on the number of HP 3000s at the site. The program is from Computer Innovations Co., 9405 Braemar Terr., Charlotte, NC 28210; 704-543-1402.

CIRCLE 8 ON READER SERVICE CARD

CURT BERNER

Software Tracks Letters of Credit, Letter Amendments, and Partial Shipments



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12  (,2) U [W14] 16654.4

 A      B      C         D                E          F     G        H
SIXMONTHS  SCOTT RESOURCES
           ACCOUNTING REPORT
           SALES, ADVANCES, PURCHASES, NOTES PAYABLE, FET PAYABLE AND RE

Date Printed:     27-Jul-88 PURCHASES (428)
************************************************************************
                                  SHIPMENT             TELE
CUSTCONTROL PART   CONTROL          P/O                TRANS     DOLLAR
NUMB NUMB   SHIP     DATE          AMOUNT      SUFFIX  INDIC     AMOUNT
 1    3      4        5              12          26     30         32
104  88107         DIRECT ORDER
119  88144          19-Apr-88      16,394.40 348728            16,394.40
120  88160          07-Jun-88
119  88172          15-Jun-88
119  88178          15-Jun-88
104  88141  CANCEL
122  88159          08-Jun-88
147  88168          14-Jun-88
122  88158          08-Jun-88
147  88166          14-Jun-88
9-Sep-88  01:28 PM                           CALC
```

LC TRACKER is a *1-2-3* template that lets you record and follow all your letters of credit. The software matches loan and letter-of-credit numbers, allowing you to check any outstanding-loan balance. The program's formats let you produce status reports, including sales, accounting, shipping, and purchase orders.

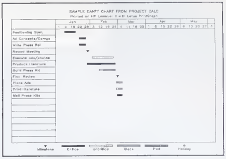
LC Tracker requires *1-2-3* Release 2/2.01 and runs on the IBM PC, PS/2, and compatible computers with 640K of RAM. It costs $295, from Karatz-Nogel Accountancy Corp., 282 Second St., San Francisco, CA 94105; 415-882-7373.

CIRCLE 9 ON READER SERVICE CARD

Project Calc Now Available as Symphony Add-in, Lets You Telecommunicate Projects

PROJECT CALC, originally released as a *1-2-3* add-in, allows you to create multiple projects on a *Symphony* worksheet, display Gantt and PERT charts, and produce work schedules and cost reports. You can work in any *Symphony* environment, allowing you to send projects off site via modem through the COMM environment.

Project Calc requires *Symphony* Release 1.1, 1.2, or 2.0 and runs on the IBM PC, PS/2, and compatible computers with 640K of RAM. Expanded memory and a hard disk are recommended. It costs $149.95, from Frontline Systems, P.O. Box 7408, San Francisco, CA 94120; 800-451-0303, ext. 55; in Calif. 916-677-7171.



CIRCLE 10 ON READER SERVICE CARD

On-Line Help Programs for Popular Software Provide Several Levels of Detail

SUPERHELP is a series of pop-up programs that provide additional on-line help for *1-2-3, dBase III Plus, WordPerfect*, and DOS through version 4.0. Each program lists items alphabetically and by functional description so that you can easily locate the command sequences you need. Each program can also serve as a training tool because it actually shows you the result of a command (using its sample data) before you try it on your own data.

SuperHelp uses 97K of RAM. Versions for *1-2-3* Release 2/2.01, *WordPerfect* Version 4.2/5.0, *dBase III Plus*, and DOS are available separately for $49.95, from TDA, 15353 Northeast 90th St., Redmond, WA 98052; 800-423-7140, in Wash. 206-883-6954.

CIRCLE 11 ON READER SERVICE CARD

Tutorial on Running Monte Carlo Simulations in 1-2-3

MONTE CARLO SIMULATION contains a 25-page manual and a disk of models to show you how to use this risk-forecasting tool on *1-2-3* data. You can learn to run simulations and sensitivity analyses with multiple variables. The program includes an engineering and a financial-forecasting model.

Monte Carlo Simulation uses 160K of RAM, requires any release of *1-2-3*, and runs on the IBM PC, PS/2, and compatible computers. It costs $30, from Entropy Assoc., 1667 Cole Blvd., Golden, CO 80401; 303-238-0116.

CIRCLE 12 ON READER SERVICE CARD

1-2-3 Template Automates Check Writing and Bank-Statement Reconciliation

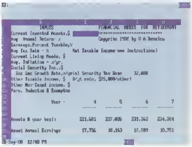
MR. CHECKBOOK lets you record bank deposits, withdrawals, and checks. The program helps you balance your checkbook and bank statement and carries outstanding items into the next month. The software automatically puts the payee's name and address on a check for easy mailing.

Mr. Checkbook uses 256K of RAM, requires *1-2-3* Release 2/2.01, tractor or laser-fed checks (not included), and runs on the IBM PC, PS/2, and compatible computers. It costs $39.95, from TRS Technologies, 3721 South Westnedge, Suite 87, Kalamazoo, MI 49001; 616-344-7622.

CIRCLE 13 ON READER SERVICE CARD

Program Helps Retirees Know If Current Investments Will Run Out

FINANCIAL NEEDS FOR RETIREMENT, while aimed at retirees, can be used by anyone to project his or her financial status over a 25-year period. You input such financial information as taxable and nontaxable assets, asset returns, tax rates and inflation rates, social security income and growth rate, and living expenses. You'll see what types of investment and life-style changes you may need to make.



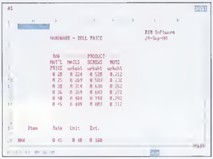
```
                 INPUTS                 FINANCIAL NEEDS FOR RETIREMENT
Current Invested Assets,$               ==============================
Avg Annual Return- %                    Copyrite 198? by V A Denslow
Earnings,Percent Taxable,%
Avg Tax Rate - %          Net Taxable Income-see Instructions)
Current Living Needs, $
Avg. Inflation - %/yr.
Social Security Inc.,$
  Soc Sec Growth Rate,%/yrial Security Tax Base     32,000
Other Taxable Income, $   0/jt retn, $25,000/other)
Other Non-Taxed Income, $
Pers. Deductns & Exemptns

               Year -          4         5         6         7
                           -------   -------   -------   -------

Assets @ year begin        221,581   227,035   231,362   234,384

Asset Annual Earnings       17,726    18,163    18,509    18,751
20-Sep-88  12:48 PM
```

Financial Needs for Retirement works with *1-2-3* Release 2/2.01 and runs on the IBM PC and compatible computers with 264K of RAM. It costs $45, from V. A. Denslow & Assoc., 4151 Woodland Ave., Western Springs, IL 60558; 312-246-3365.

CIRCLE 14 ON READER SERVICE CARD

Set of 1-2-3 and Symphony Macros Helps You Build Data Tables

SUM!TABLE consists of four macros that let you produce various tables of results from your worksheets. The 1-Way macro lets you tabulate any number of what-if calculations based on one variable; 2-Way calculates an answer based on two variables; 3-Way is similar to 1-Way, but you can put data in more than one file; and Transfer puts data from many files into a summary table.



```
A1                                                          SHEET

                                              RIM Software
             HARDWARE - SELL PRICE            24-Sep-88

              RAW        PRODUCT-
             MAT'L  NAILS  SCREWS  NUTS
             PRICE  wrksht wrksht  wrksht
             0.20   0.224  0.520   0.212
             0.25   0.269  0.583   0.232
             0.30   0.314  0.638   0.252
             0.36   0.359  0.693   0.272
             0.40   0.404  0.748   0.292
             0.45   0.449  0.803   0.312

        Item       Rate   Unit    Ext.

    RAW            0.45   0.40   0.180
```

Each macro uses 3.5K of RAM, requires *1-2-3* Release 2 or *Symphony* Release 1.1 or 1.2, and runs on the IBM PC, PS/2, and compatible computers. It costs $17 per macro or $45 for the set, from Rim Software, P.O. Box 598, Granby, CT 06035; 203-653-5646.

CIRCLE 15 ON READER SERVICE CARD

Update Produces Presentation-Quality Reports from a 1-2-3 or Symphony Database

R&R
Worksheet Report Writer
Create presentation-quality reports in any layout, quickly, directly from Lotus' database worksheets.

R&R WORKSHEET REPORT WRITER, the upgraded *Lotus Report Writer*, runs as an add-in or a stand-alone package. You can place and move database fields and text anywhere in a report. The program adds 100 @functions and provides eight sort and eight grouping levels. You can combine data from 10 related databases in one report. And you can convert *Lotus Report Writer* reports to *R&R*.

R&R Worksheet Report Writer uses 320K of RAM as a stand-alone and works with any version of *1-2-3* or *Symphony*. It uses 20K as an add-in and requires *1-2-3* Release 2/2.01 or any version of *Symphony*. It runs on the IBM PC, PS/2, and compatible computers and costs $149, from Concentric Data Systems, 18 Lyman St., Westboro, MA 01581; 800-325-9035, in Mass. 508-366-1122.

CIRCLE 16 ON READER SERVICE CARD

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© 1988 Software Publishing Corporation, 1901 Landings Dr., Mt View, CA 94039-7210 Runs on IBM PC and MS DOS compatibles

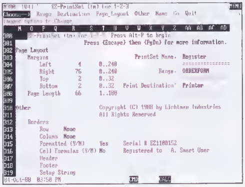
Print Spoolers Claimed to be 5 to 50 Times Faster Than Other Hardware or Software Spoolers

TORQ for dot-matrix printers and *LaserTorq* for lasers let you create any amount of print-buffer space on your hard disk, in conventional, expanded, or extended memory. *LaserTorq* prints a full-page graph at 300 dpi on a Hewlett-Packard LaserJet Plus or Series II printer with no extra memory. The spoolers do not slow down the printer.

Torq uses 15K of RAM and costs $79; *LaserTorq* uses 19K of RAM and costs $99. Both run on the IBM PC, PS/2, and compatible computers. They are from LaserTools Corp., 3025 Buena Vista Way, Berkeley, CA 94708; 800-346-1353, in Calif. 415-843-2234.

CIRCLE 17 ON READER SERVICE CARD

Utility Lets You Store Several Print Settings for One Spreadsheet



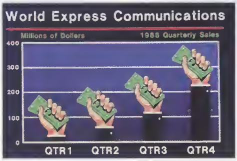
```
N300  1041 '     EZ-PrintSet (tm) for 1-2-3                                  MENU
Choose--> Range  Destination  Page_Layout  Other  Name  Go  Quit
Choose option to Change
      N   O   P   Q    R    S   T   U   V   U   X   Y   Z   AA  AB  AC  AD
300     EZ-PrintSet (tm) for 1-2-3  Press Alt-P to begin
301                      Press {Escape} then {PgDn} for more information.
302 Page Layout
303     Margins                                    PrintSet Name.  Register
304         Left          4      0..240                            ================
305         Right        76      0..240                    Range.  ORDERFORM
306         Top           2      0..32
307         Bottom        2      0..32   Print Destination'  Printer
308     Page Length      66      1..100
309
310 Other                        Copyright (C) 1988 by Lichtman Industries
311                              All Rights Reserved
312     Borders
313         Row      None
314         Column   None
315         Formatted (Y/N)      Yes     Serial # EZ1100152
316         Cell Formulas (Y/N) No       Registered to   A. Smart User
317         Header
318         Footer
319         Setup String
04-Oct-88  03:50 PM                            CMD       CALC
```

EZ-PRINTSET allows you to produce many reports from one spreadsheet without having to reset printer information each time. You can change all your spreadsheet's print settings on one screen. The program enables you to name print settings for various ranges in a worksheet or use different headers and footers in the same range.

EZ-PrintSet uses 30K of RAM, requires *1-2-3* Release 2/2.01, and runs on the IBM PC, PS/2, and compatible computers. It costs $26.95 for 5¼-inch disks or $28.95 for 3½-inch disks, from Lichtman Industries, Lackawanna Plaza, Millburn, NJ 07041; 201-467-0010.

CIRCLE 18 ON READER SERVICE CARD

Program Provides Clip Art for Lotus Freelance Plus



IMAGEFILE is an art library whose images are set to run with black-and-white, color, and VideoShow output devices. A utility disk provides a color-palette substitution between output devices. The library's 15 categories, such as industry, transportation, people, time, and finance, include 250 images.

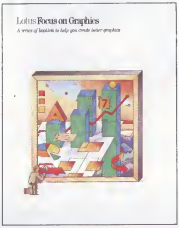
ImageFile uses 2K of RAM, requires *Lotus Freelance* or *Freelance Plus*, and runs on the IBM PC, PS/2, and compatible computers. It costs $495, from Applied Microsystems, 510 West Tudor Rd., Suite 3, Anchorage, AK 99503; 800-327-2588, in Alaska 907-563-1313.

CIRCLE 19 ON READER SERVICE CARD

Set of Five Instructional Booklets from Lotus Covers Business Graphics

LOTUS FOCUS ON GRAPHICS tells and shows how to prepare effective business presentations, concentrating on Lotus's own *Freelance Plus, Graphwriter II*, and *Manuscript*. You can learn to create text charts, the most common type used for presentations; select the best chart type to represent your data; build effective presentations, starting with the concept; turn your charts into high-impact graphics; and use diagrams, charts, and maps to get your message across.

The five booklets are each about 40 pages long. A demo disk is included. Published in September, the set costs $29.95, from Lotus Selects, P.O. Box 9172, Cambridge, MA 02139; 800-635-6887.



CIRCLE 20 ON READER SERVICE CARD

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♥

1-2-3

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CIRCLE 199 ON READER SERVICE CARD

ESSAY

WHAT LOTUS LEFT OUT

BY DANIEL SELIGMAN

Heavily weighing down my desk as I type these words are an estimated 85 pounds of computing equipment. Far lighter, but equally significant, is my 4-ounce Radio Shack calculator. What is the calculator doing there? Why do I need it after shelling out $5,000 on a computer and software with dazzling number-crunching capabilities?

The fact is that a lot of us PC users keep a calculator handy. Computers, we've learned, are less handy than calculators for some kinds of crunching. In my case, the most maddening deficiency is the PC's clunkiness in handling certain probability problems.

Take a problem to which I was initially introduced several decades ago, while attending an elite high school in New York City. The person who brought the problem to my attention was the school bookmaker. His proposition, available in the cafeteria every day until 1 P.M.: Pick any three baseball players expected to be in that day's lineup. You could pick from among the game's greatest hitters—Joe DiMaggio, Ted Williams, Ducky Medwick, anybody. If your three players got six or more hits among them, the bookie paid off at 2 to 1. If they didn't, he kept your quarter (the minimum bet). I wasn't maintaining very good records in those days, but it's my strong impression that he almost always kept my quarter.

I recently described this baseball action to a high schooler, who raised the obvious question: How fair were 2-to-1 odds? Promising an answer, I sat down at the computer and instantly felt handcuffed. Like many probability problems, the six-hit proposition is best solved through a formula that depends on factorials. A number's factorial is the product of successive multiplications of every integer from the number down to 1. For example, the factorial of 5 is 5 × 4 × 3 × 2 × 1 = 120. Many calculators, including my Radio Shack model, enable you to establish the factorial of any number up to 69 with a single keystroke. But computers are far less accommodating. There is no factorial command in BASIC and no @FACTORIAL function in *1-2-3*.

To be sure, there are alternatives. You could forget about factorials and arrange for your PC to run a Monte Carlo simulation of the event whose probability you're considering. The Monte Carlo approach, originally developed by mathematicians working on the atomic bomb during World War II, depends on the use of random numbers, which are available to some degree or another in both BASIC and *1-2-3*. For example, you could plausibly assume that each of your three batting stars would get four official times at bat in each game. You might also assume that each has a batting average of .350. In that case, you would represent a turn at bat by generating random numbers from 1 to 100 and counting any number from 1 to 35 as a base hit.

Monte Carlo simulations are a plausible approach to some probability problems, especially those in which many variables have extremely complex interactions and for which a precise calculation of the odds could be next to impossible. However, Monte Carlo has its shortcomings. Your final answers may vary a bit from one experiment to another; they are necessarily imprecise. When you deal with something relatively simple like my three batters, you should use the factorial-based formula and get the precise odds, which, my calculator tells me, are 3.7 to 1.

Why does my PC make it hard to get this valuable information? I raised that question with a product-development person in the spreadsheet business. He indicated that the answer depends on perceived consumer demand; that is, he doesn't think of his median user as a gambler. I wonder how accurate that perception is.

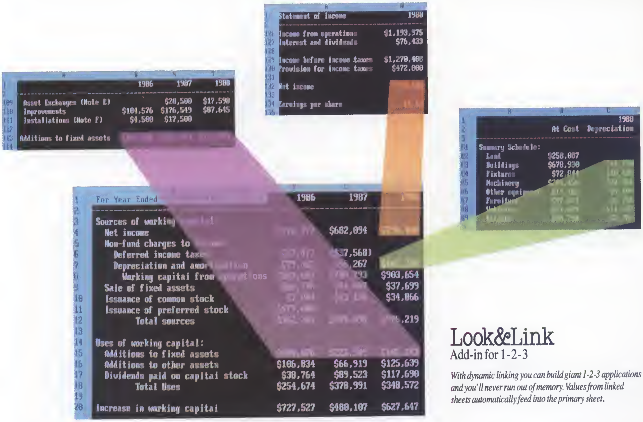
Although not privy to market research on spreadsheet users, one prototypical case, I assume, is this sales manager I keep reading about in the *1-2-3* literature. This fellow is endlessly reranking his people in different regions, creating formulas for their bonuses, and calculating his optimal head count on various sales assumptions.

Maybe he never fights the NFL point spread. But his job still requires him to make probabilistic assessments of the people working for him, and those assessments can involve real gambles on his part. I assume that there even are times when he is implicitly betting on his three top salespeople to do better than average in some accounting period and that he wouldn't mind learning the odds on some such triumph.

The man needs factorials. That, plus more luck than I had with DiMaggio. ■

Daniel Seligman writes Fortune *magazine's "Keeping Up" column.*

JANE STERRETT



```
                              1986       1987       1988
Asset Exchanges (Note E)               $20,500    $17,590
Improvements               $104,576   $176,549    $87,645
Installations (Note F)       $4,500    $17,500

Additions to fixed assets
```

```
Statement of Income                          1988

Income from operations                 $1,193,975
Interest and dividends                    $76,433

Income before income taxes             $1,270,408
Provision for income taxes               $472,000

Net income

Earnings per share
```

```
                                     1988
                   At Cost   Depreciation
Summary Schedule:
  Land            $250,087
  Buildings       $678,930
  Fixtures         $72,8
  Machinery
  Other equip
  Furnitu
```

```
For Year Ended                     1986       1987

Sources of working
  Net income                              $682,094
  Non-fund charges to
    Deferred income tax                   ($37,568)
    Depreciation and amo                      ,267
      Working capital from                        $903,654
  Sale of fixed assets                             $37,699
  Issuance of common stock                         $34,866
  Issuance of preferred stock
        Total sources                                 ,219

Uses of working capital:
  Additions to fixed assets
  Additions to other assets     $106,834   $66,919   $125,639
  Dividends paid on capital stock $38,764  $89,523   $117,690
        Total Uses              $254,674  $378,991   $348,572

Increase in working capital     $727,527  $480,107   $627,647
```

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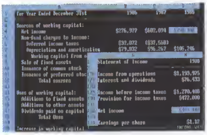

```
For Year Ended December 31st          1986       1987       1988

Sources of working capital:
  Net income                      $276,977   $682,094
  Non-fund charges to income:
    Deferred income taxes          $32,072   ($37,568)
    Depreciation and amortization  $79,032    $96,267   $106,246
      Working capital from o
  Sale of fixed assets
  Issuance of common stock
  Issuance of preferred stoc
        Total sources

Uses of working capital:
  Additions to fixed assets
  Additions to other assets
  Dividends paid on capital
        Total Uses

Increase in working capital
```

```
Statement of Income                      1988

Income from operations             $1,193,975
Interest and dividends                $76,433

Income before income taxes         $1,270,408
Provision for income taxes           $472,000

Net income

Earnings per share                      $1.32
                                   INCOME.WK1
```

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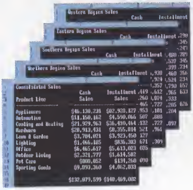

```
Western Region Sales
                          Cash     Installment
Eastern Region Sales
                          Cash     Installment
Southern Region Sales
                          Cash     Installment
Northern Region Sales
                          Cash     Installment
Consolidated Sales
                          Cash     Installment
Product Line              Sales       Sales
--------------------------------------------
Appliances         $46,130,231  $02,920,127
Automotive         $11,150,162   $4,590,066
Cooling and Heating $21,929,963 $36,410,464
Hardware           $20,913,431   $8,355,014
Lawn & Garden       $3,704,021   $3,923,450
Lighting            $1,466,105     $836,303
Office              $6,465,617   $5,613,023
Outdoor Living      $2,321,777   $1,614,502
Pet Care              $800,052     $134,260
Sporting Goods      $9,093,360   $4,062,033

                  $132,079,599 $140,469,002
```

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